MISSOURI

BOTANICAL GARDEN.

TENTH ANNUAL REPORT.

ST. LOUIS, MO.:
PUBLISHED BY THE BOARD OF TRUSTEES.
1899.

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* *Ex-officio.*

[1] Elected President of the Board of Public Schools of St. Louis, October 11, 1898, to succeed Paul F. Coste, who had held that office since May 31, 1897.

PREFACE.

Under the direction of the Board of Trustees, the tenth annual report of the Missouri Botanical Garden is presented to the public. The ninth report was issued April 16, 1898. In addition to the administrative reports for 1898, which contain a summary of the results achieved during the period since the manangement of the Garden devolved upon the Trustees designated by Henry Shaw in his will, and two scientific papers, the present volume contains a biographical sketch of the late Dr. E. Lewis Sturtevant, whose gifts to the Garden have from time to time been announced in these reports, kindly prepared by Professor C. S. Plumb, at the request of the Board of Trustees, a list of publications issued from the Garden in 1897 and 1898, a list of the serial publications received at the Garden library, and comprehensive indexes to the contents of the ten annual reports of the Garden thus far issued.

These reports are sent to scientific institutions and journals, in exchange for publications and specimens desirable for the library, herbarium, or plant-houses of the Garden. So far as possible, reprints of the botanical articles they contain are sent to botanists occupied with a study of the same subjects.

Any of the Garden publications not out of print may be purchased, at approximately the cost of publication, from The Cambridge Botanical Supply Co., of Cambridge, Mass., W. Wesley & Son, of London, R. Friedländer & Sohn, of Berlin, or the undersigned.

WM. TRELEASE.

St. Louis, Mar. 30, 1899.

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A PALM GROUP.

REPORTS FOR THE YEAR 1898.

REPORT OF THE OFFICERS OF THE BOARD.

SUBMITTED TO THE TRUSTEES JANUARY 11, 1899.

To the Board of Trustees of the Missouri Botanical Garden:

We herewith present the financial results for the year ending December 31, 1898.

Our income from rentals continues to show a steady increase, being $1,094.61 in excess of those of 1897, and a still further increase is expected during the ensuing year.

Several buildings vacated during the year have been thoroughly repaired and tenants secured and the condition of nearly all the properties of the Trust has been improved, the vacancies are fewer in number than for several years past and no reductions in rent are demanded or anticipated.

The improvement of Flora Avenue has been completed upon the plans mentioned in our last report, including the erection of a magnificent entrance, costing $9,500, on Grand avenue to Flora Boulevard, which furnishes a splendid double driveway with a park place in the center fifty feet wide and running the full length of the avenue 4,440 feet directly to the main entrance to the Missouri Botanical Garden. These improvements were made jointly by the owners of the property on the south side and the Board, costing in all $103,909.00, our proportion being $44,840.78, which has all been paid for, in part out of our surplus.

No decision has yet been rendered by the Supreme Court of the State of Missouri on our application made in October, 1897, for power to sell certain non-productive property, although a second argument was ordered which was made on Tuesday, April 8, 1898, but a decision is looked for in the near future. Owing to the delay in securing this decision and the large demands made upon our surplus for street improvements during the past two years, no work has been done on the proposed addition to the Garden nor have any extensive additions been made either to the Garden Library or Herbarium, but the following sums have been credited to the stock account which now aggregates $1,568,251.08 : —

Library	$3,557 84
Herbarium	2,862 00
	$6,419 84

Mr. Shaw's bequests for banquets, sermon, Shaw School of Botany and premiums for flower show have all been carried out as provided for in his will, and after caring for the Garden, and keeping the properties of the Trust in good repair and fully insured, and the payment of taxes, and other expenses, all out of the revenue of the year, we are enabled to carry forward a surplus for the year of $14,247.01.

RECEIPTS.

Rents	$96,512 28	
Interest and dividends	950 63	
Garden pasturage	428 91	
Garden handbook sales	48 25	
Publication sales	18 45	
Insurance of rentals, loss	10 00	
Insurance of buildings, loss	692 24	$98,660 76
Cash balance, January 1, 1898		58,408 88
Total		$157,069 64

EXPENDITURES.

Garden Account,		
Labor pay-roll	$12,476 48	
Students' pay-roll	1,608 90	
Office assistance	634 56	
Fuel	1,044 98	
Water	703 00	
Repairs and supplies	1,842 93	
Stable and implements	478 32	
Plants and seeds	1,366 29	$20,155 46
Herbarium Account,		
Office assistance and janitor	434 04	
Extra mounting and inserting	140 69	
Fuel	75 08	
Current expenditure and specimens	1,259 87	1,909 68
Library Account,		
Office assistance	918 92	
Fuel	75 08	
Current expenditures and books	1,731 76	2,725 76
Office Account,		
Salaries	4,525 94	
Fuel	75 07	
Current expenditure	361 96	4,962 97
Research Account,		
Salaries	834 96	
Current expenditure	124 65	959 61
Scholarship Account,		
Instruction	521 87	
Care of lodge	240 00	
Fuel	39 89	
Current expenditure	84 76	886 52
Total current Garden expenses		$31,600 00
Garden Improvement Account,		
F. L. & J. C. Olmsted, services		564 47
Total on Garden		$32,164 47
Publication Account,		
Annual volume	1,690 30	
Preparation of library catalogue	253 65	1,943 95
Carried forward		$34,108 42

Brought forward		$34,108 42
Property Expenses,		
State, school, city and sprinkling tax	$30,668 91	
Streets, sidewalks and sewers	21,900 82	
Insurance	4,334 24	
Repairs	6,016 86	
New improvements	145 50	$63,066 33
Office Expense,		
Salaries	3,600 00	
Rent of office	780 00	
Printing, postage, advertising and telephone	573 29	4,953 29
Bequests,		
Flower Show	456 00	
Flower Sermon	200 00	
Trustees' Banquet	893 50	
Gardeners' Banquet	347 04	
Washington University, School of Botany	1,226 40	3,122 94
Sundries,		
Legal expenses	371 35	
Repairs to buildings damaged by fire	692 24	1,063 59
		$106,314 57
Certificates of deposits invested in 1898		50,000 00
Cash on hand December 31, 1898		755 07
		$157,069 64

The books of the Board have been closed after showing the operations for the year ending December 31, 1898, and after charging to Real Estate Account the balance of Streets, Sidewalks and Sewer Account, $21,900.82, the income has been disposed of as follows: —

Rent Account	$96,512 28
Interest and dividends	950 63
Insurance of rentals	10 00
Garden handbook sales	48 25
	$97,521 16

CONTRA.

Garden expenses	$31,171 09	
Garden improvements	564 47	
Office expense	4,953 29	
Repairs	6,016 86	
Insurance	4,334 24	
New improvements	145 50	
Legal expenses	371 35	
Washington University, School of Botany	1,226 40	
Annual Flower Sermon	200 00	
Annual Trustees' Banquet	893 50	
Annual Gardeners' Banquet	347 04	
Annual Flower Show	456 00	
Publications	1,925 50	
	$52,605 24	
Taxes	30,668 91	$83,274 15
Surplus for the year		14,247 01
		$97,521 16
Surplus to Dec. 31, 1897		$76,077 10
Surplus for 1898		14,247 01
		$90,324 11

Our surplus on December 31, 1898, is accounted for as follows: —

Improvement of Flora Avenue	$39,569 04
Bank certificates of deposit	50,000 00
Cash	755 07
	$90,324 11

Respectfully submitted,

R. J. LACKLAND, President.

Attest:
A. D. CUNNINGHAM, Secretary.

TENTH ANNUAL REPORT OF THE DIRECTOR.

SUBMITTED TO THE TRUSTEES JAN. 11, 1899.

To the Board of Trustees of the Missouri Botanical Garden:

The following report on the Missouri Botanical Garden and the Henry Shaw School of Botany is respectfully submitted, in compliance with your rules. As this is the tenth report submitted since the organization of the Garden under the care of the Board, and therefore marks a convenient period in the history of the institution, it is made to include a resumé for this entire term.

THE BOTANICAL GARDEN.

Tersely stated, the objects contemplated by the founder of the Garden, as indicated in his will,* are, the maintenance of a garden easily accessible to the public, excepting on Sundays and holidays, for the cultivation, propagation and study of plants; the exchange of material; the equipment, maintenance and utilization of a museum, herbarium and library; the gathering about the institution of a corps of instructors and investigators, with suitable laboratory and instrumental equipment; the provision for public lectures, from time to time; the prosecution of research in botany in the broadest sense, including vegetable physiology, the diseases and injuries of plants, and horticulture, and other branches of science closely connected with these; and the instruction and training of gardeners.

In appointing a Director for the Garden, with the general duty of carrying out the provisions of Mr. Shaw's will, so

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* Rept. Mo. Bot. Gard. 1 : 29.

PAMPAS GRASSES.

far as this could depend upon him, the Board of Trustees adopted a few simple rules for persons making use of the institution, and a comprehensive skeleton outline for the guidance of the Director.*

During the period covered by this report, the Garden has been kept open to the public at the times designated by the founder,† and has been maintained in as attractive a manner as the means at the disposal of the Board have permitted. While, as has been indicated in previous reports, year by year, the attractive features of the Garden have been annually augmented, the severe tornado of May 27, 1896 wrought great havoc with the trees, so that at the time, 450 trees were destroyed, and, as a result of the injuries that they then received, some hundreds of others have since died and been removed.‡

The plant-houses, which, when the Board assumed control of the Garden, were all of antiquated models and defective construction, from time to time have been placed in somewhat better condition; and the system of houses was increased by the addition, in 1894 and 1897, of a modern well-lighted house, a part of which is devoted to a collection of orchids, while another part is planted out, in a natural and attractive way, to ferns, cycads, etc.§ In 1895, a modern vegetable forcing house and grapery was added.‖ Notwithstanding these additions, at present the house capacity is by no means adequate for the cultivation of the large number of species of plants which are now growing under glass, and, as has been reported previously,¶ it is hoped that ultimately very considerable additions may be made, in which case it should prove possible to set aside certain houses exclusively for bringing plants into bloom for display in other houses which are used exclusively for that

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* Rept. 1 : 92. 8 : 12.
† Rept. 1 : 32, 51, 92. 6 : 11.
‡ Rept. 8 : 18. 9 : 18.
§ Rept. 6 : 14. 7 : 14.
‖ Rept. 7 : 16.
¶ Rept. 8 : 37, 41.

purpose, while still other houses, as is the case with all at present, will be devoted to mixed collections, among which some plants are in vegetation, while others are in flower, all of the time.

Though the will of Mr. Shaw expressly indicates as desirable the extension of the grounds, from time to time, and the Board, some years since, placed the preparation of suitable extension plans in the hands of Messrs. Olmsted, Olmsted & Eliot, the well-known landscape architects, for the reasons stated in my last two reports* it has been impossible to begin actual work on the proposed extension, which is intended to include, in addition to smaller special groups, a permanent synopsis of the North American flora, representing the classification of Bentham and Hooker, and a permanent general synopsis of the higher groups of the vegetable kingdom, representing the more recent phylogenetic classification of Engler and Prantl.† Pending the receipt and adoption of the entire plans of the firm named, no considerable planting of trees and shrubbery in even the older part of the grounds is being undertaken.

The decorative features for 1898 were maintained on about the same lines as in previous years, and although, as is inevitable in a botanical institution, many species of plants which are of scientific interest but of no decorative value and only transient duration have been cultivated, an effort has been made to add to the permanent collection species of truly decorative value, both tender plants requiring shelter in the plant-houses and those capable of being used in the open air, either for bedding purposes or as hardy perennials requiring no special care to secure their continuance from year to year.

The collection of plants, which in 1895‡ was estimated at

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* Rept. 8 : 46. 9 : 13. † Rept. 8 : 39.

‡ Rept. 7 : 14. — The inventory showed 3,921 named forms other than annuals, of which 1,000 were supposed to be in cultivation in the year mentioned.

5,000 species and varieties, was found by a careful inventory then taken, to include, in 1898, 8,009 species and varieties, of which all but one or two hundred are named with more or less accuracy. Among the collections specially worthy of mention are the cacti, of which 462 species are cultivated (306 in 1895); the orchids, represented by 548 named forms (156 in 1895); the aroids, of which there are 274 species (93 in 1895); the ferns, including 169 species (84 in 1895); and palms, 61 species (65 in 1895, and, unquestionably because of the inclusion of other things, 106 in the administrator's inventory);* while of hardy trees and shrubs there are 1,811 species and varieties (862 in 1895), of hardy herbaceous plants 2,179 (1,129 in 1895), and of vegetables 1,016 (201 in 1895). Roughly divided, the collection includes 5,006 hardy forms and 3,003 cultivated under glass.

Though, because of the difficulty and expense of shipping plants and seeds from the United States to foreign countries,† it has been impracticable to make the duplicates of the Garden collections as useful to other institutions as would otherwise have been desired, an effort has always been made to supply material required elsewhere for cultivation or research; and under the new agreement of the countries comprised in the Universal Postal Union, it is hoped that in future the Garden can be far more useful than heretofore to its foreign correspondents, in supplying them with desirable seeds, cuttings and small plants. Each year, under the direction of the Board, the surplus bedding material on hand in the spring, after the grounds were planted, and many bedding plants, potted on the approach of cold weather, have been distributed to hospitals, missions and other charities, and the kindergartens of the public school system of St. Louis.‡

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* Rept. 1:102.

† Rept. 7:16. 8:16.

‡ Rept. 4:13. 5:13. 6:14. 7:15. 8:16. 9:12.

In return for seeds and plants, and for its publications, a considerable number of consignments of plants are each year presented to the Garden,* and extensive but conservative purchases are annually made. During 1898, 274 such consignments were received, of which 225, including 4,597 plants or packets of seeds and valued at $1,317.68, were presented. The expenditure for plants and seeds for the year was $1,366.29. By way of exchange, 132 packets of seeds and 321 plants, appraised at $111.80, were sent out; and 1,340 plants were presented to schools and charities.

Until midsummer of the present year, no definite count of visitors to the Garden was kept, the rough estimate of the gate-keeper and Head Gardener showing that there seemed to be a gradual increase in the number of persons who made use of the Garden in each successive year. Beginning with the middle of July of 1898, however, the gate-keeper has kept an accurate record of the visitors passing the gate, and his report shows 32,867 persons for week days during the period covered by the count. The smallest number, on the 21st of November, was 6. The largest number on any week day was 1,640, on October 6, which was the special holiday of the week of the St. Louis Fair. In June, on the Sunday afternoon when, in accordance with the provision of Mr. Shaw's will, the Garden was open to the public, 12,908 persons were counted, and on the first Sunday afternoon in September, when the Garden was likewise open to the public, under the same provision, 5,465 persons were counted. Estimating the number of visitors as approximately the same during the two halves of the year, it appears that the total number for 1898 may have been 89,102.

For reasons repeatedly stated in earlier reports,† the

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* Rept. 4:12. 5:12. 6:14. 7:14, 16. 8:17. 9:12.

† Rept. 1:31, 35, 37, 50, 93. 2:25. 3:16. 8:19, 21. 9:16.

small museum which was established in the lifetime of Mr. Shaw, but which, when the Board assumed control of the Garden, was hardly in condition to be kept opened, is still used for other purposes, so that the Garden is yet without a public museum, although it possesses very considerable accumulations of research material properly classed as part of a museum equipment, though, from its nature, not displayed for public inspection. The extension plans already referred to provide for the ultimate establishment of an adequate museum.*

The herbarium, which started with the important Engelmann and Bernhardi collections,† and which has been reported on annually, and to which, in 1897, were added the extensive Redfield, Jermy and Joor herbaria,‡ was increased during 1898 by the addition of many small collections from the United States and other regions, of which a very large number of specimens are still unmounted. The new material incorporated comprises, after deducting one duplicate sheet withdrawn from the Engelmann herbarium and two from the general collection, 19,079 sheets of specimens, of which 7,103 were bought, 6,995 pertain to the Redfield collection, 2,475, appraised at $123.75 were collected by Garden employees, and 2,506, appraised at $125.30,§ were presented, chiefly in exchange for Garden publications. By way of exchange, 462 herbarium specimens, valued at $23.10 were distributed to correspondents of the institution; and for research and museum purposes, 33 specimens of alcoholic material and 194 packets of nuts were presented to similar establishments.

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* Rept. 8:43–4.

† Rept. 1:93. 2:24–5. 3:15. 8:19.

‡ Rept. 9:14.

§ These valuations, as in earlier volumes, for the unmounted specimens as received.

The present composition of the herbarium is as follows: —

Engelmann Herbarium (all groups), about.....			97,800 specimens.
The General Herbarium: —			
Higher plants.			
The J. J. Bernhardi Herbarium.....	61,121		
The J. H. Redfield Herbarium*.....	11,506		
Other specimens.....	114,965		
		187,592	"
Thallophytes.			
The J. J. Bernhardi Herbarium*....	126		
Other specimens.....	21,942		
		22,068	"
Making a total of about.....		307,460	"
Valued at.....			$46,119 00†

The following, practically a part of the herbarium facilities, is essentially the same as for some years past:‡ —

Wood specimens of various sizes.....	1,027,	valued at	$100 00
Wood veneers, by Spurr, Hough, Nördlinger, and Michel.....	2,254,	"	" 155 00
Microscope slides, by Hough, Penhallow, Munroe, and others.....	1,051,	"	" 250 00
Together.....	4,332,	"	" $505 00

The library, which, when the Board assumed control of the Garden, contained the books and pamphlets of the late Dr. George Engelmann and a small but select collection of botanical works purchased at various times by Mr. Shaw, has each year grown in a gratifying manner, as has been

* So far as yet incorporated.

† The valuation of such collections is purely arbitrary, since they could not be exactly replaced for any amount of money, in case of loss; but they are now, by direction of the Board, reappraised at $15.00 per hundred mounted sheets, — a more accurate valuation, for such as could be replaced by purchase, or for the estimate of building up a new herbarium of mounted material in case of loss, than the previous valuation of $10.00 per century.

‡ Rept. 8: 20. 9: 15.

indicated in each of the previous reports.* During 1898, 260 books and 76 pamphlets were purchased, the total expenditure for the library, as shown by the Secretary's books, being $1,731.76; and 427 books and 867 pamphlets, appraised at $1,103.60, were presented or received in exchange for the publications of the Garden.

The manuscript index has been increased by the addition of some 62,248 cards. Of these an estimated number of 52,300, referring to the literature of field, garden and orchard plants, were presented to the Garden by the late Dr. E. Lewis Sturtevant, who personally attended to carefully packing them for shipment, shortly before his death, in July last; 4,365 cards, chiefly referring to the literature of the agricultural experiment stations and to new species and varieties of plants described within the last few years, were bought, and 5,583, largely referring to illustrations, were written by employees of the Garden.

As now constituted the library contains: —

Pamphlets.....	19,003			
Books (general).....	13,116			
	32,119	valued at.....		$46,203 67
Books (Sturtevant Prelinnean Library)†.....	463	"	"	2,315 00
MS. volumes (Engelmann and Roetter)	61	"	"	700 00
Total.....	32,643	"	"	$49,218 67
Index cards.				
Various.....	192,385			
Sturtevant Index.....	52,300			
Total	244,685	"	"	2,446 85
Total valuation.....				$51,665 52

* 8:21. 9:15.

† The original number and arbitrary valuation of the collection presented by Dr. Sturtevant (Rept. 8:21). On the Prelinnean shelves are now found a much larger number of volumes than is indicated here, the accession and valuation of these, however, from year to year being included in the general accession lists and the valuation of the library as a whole.

In the summer of 1898, Dr. George J. Engelmann, who, for six years, until his removal from St. Louis, served as a member of the Board of Trustees of the Garden and who is still a member of the Advisory Committee of the School of Botany, and to whom the Garden is indebted for the presentation of the invaluable herbarium, library and manuscript notes of his father, the late Dr. George Engelmann, added to these gifts a large series of letters received at various times by his father from the leading botanists of the world. These, as well as a number of letters written by Dr. Engelmann which have come into the possession of the Garden in the same manner, are being preserved, and will ultimately be suitably mounted in bound volumes, to be added to the series of volumes of manuscript notes and sketches by Dr. Engelmann, to which reference has been made in earlier reports.*

As many additions have been made to the Sturtevant Library since the catalogue of this collection was published,† a supplementary catalogue of works published before 1753 has been prepared by Mr. C. E. Hutchings, for publication, if practicable, in the Tenth Report of the Garden.

So much of the result of Dr. Sturtevant's work on the literature of cultivated plants is now, by his own provision and action, preserved at the Garden, that, on my recommendation, the Board of Trustees have secured, through the kindness of Professor C. S. Plumb, of Indiana, who knew him well, the preparation for the Tenth Annual Report of a biographical sketch of Dr. Sturtevant, accompanied by an enumeration of his principal publications.‡ Though the actual equipment of a research institution speaks for itself, it is unusually gratifying to the Director and Trustees of the Missouri Botanical Garden to receive, in gifts like those from Dr. Sturtevant,§ the most direct

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* Rept. **6**: 16. † Rept. **7**: 123–209. ‡ Rept. **10**:
§ Rept. **4**: 14. **5**: 16. **6**: 16. **7**: 18, 123–209. **8**: 21.

and unmistakable of all expressions of approval of the lines along which their effort is being directed, and of confidence in their future actions.

In my last report,* reference was made to the preparation for publication of a general catalogue of the Garden library. The financial conditions which have caused a postponement of the inauguration of the plans for extending the grounds and plant-houses, and which have necessitated economy in adding to the scientific equipment, have also made it seem undesirable as yet to begin printing this catalogue, but as time has been found, the preparation of the cards from which such a catalogue may be printed has been continued, so that its publication will be possible whenever it is considered wise to incur the necessary expense.

The intention of the founder of the Garden that it should be developed into an institution for the promotion of the knowledge of botany, horticulture and allied sciences was recognized in the instructions drawn up for the guidance of the Director, by the Board, when they assumed control of the Garden;† and in appointing such assistants as have been necessary for the maintenance of the establishment, an effort has always been made to secure men who, while doing the necessary routine work, should be capable of devoting a part of their time to research. The principal results of such work, so far as published, were indicated in a list of publications contained in the Eighth Report of the Garden,‡ and it is hoped that a supplementary list, covering the years 1897–98, may be printed in the Tenth Report.§ I am gratified to be able to state that thus far the men who have temporarily occupied positions as assistants in the Garden, for the most part have removed to positions of greater botanical responsibility on leaving it.‖

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* Rept. 9 : 16.
† Rept. 1 : 94. 8 : 44.
‡ Rept. 8 : 221.
§ Rept. 10 :
‖ Rept. 8 : 33.

Through 1898 the office staff remained as in 1897, except that the persons engaged on the library catalogue severed their connection with the Garden as soon as their work was substantially completed, while an addition has been made to the permanent staff by the appointment of Mr. C. H. Thompson as library assistant.

A practical necessity of every institution engaged in any considerable amount of research work is the issuance of a publication in which the results of such work may be embodied; and although it is not specifically mentioned in his will, the founder of the Garden, as is evident from certain manuscript suggestions found among his papers, contemplated the issuance, sooner or later, of such a publication by the Garden. In 1890, the Board, seeing the wisdom of taking a step of this kind, authorized the publication of an Annual Report, which, as now limited, is to contain the administrative reports of the officers of the Board and the Director of the Garden, and the results, so far as desirable, of such investigation as may be carried on by the Garden staff or under the influence of the Garden.*

No small part of the value of such a publication lies in its availability for library additions by means of exchange with the scientific establishments of the world and the publishers of journals. Two years since, a tabulated statement was prepared, showing that from 1890 to 1896, inclusive, an average of $1,426.55 per year had been expended for publications of the Garden actually distributed up to that time, in return for which, from 1893 to 1896 inclusive (for which period records have been kept), herbarium and library material, in addition to that for which an equivalent had been given in herbarium material, had been received, appraised, on a low valuation, at an average of $984.85 per year.† A re-examination, brought down to the end of 1898 (during which year a considerable number of back volumes of the Garden Report were distributed to

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* Rept. 1:3. 3:3. 8:23.

† Rept. 8:25.

institutions which had not, up to that time, been on the regular mailing list), shows the expense of publishing and distributing the edition of 1,500 copies of each of the two Garden Reports printed since that statement was made to have been, — 1897, $1,992.96;* 1898, $1,690.30,† or $3,683.26 for the 3,000 volumes printed (ignoring, as has been done elsewhere, separates of some of the component articles, in pamphlet form, the cost of which, however, is included in these figures). The total expenditure for publishing and distributing reports for the nine years, therefore, including reissues of the first three already referred to,‡ is $16,708.30, or $1,856.48 per year, and each of the 15,000 copies printed during this period has therefore cost a small fraction over $1.11.

Since there remain on hand at the present time 2,066 copies of the Reports for future use, the total cost of those that have been actually distributed may now be set down as $14,415.04, or an average of $1,601.67 for each of the nine years covered by the tabulation in the Eighth Report and that here given.

As may be seen from my last report § and the preceding pages,‖ the library and herbarium of the Garden were enriched, in 1897–98, by presented material valued (after deducting the value of exchange herbarium material sent out by us), on a low basis, at $2,747.29, or an average of $1,373.64 for each of the two years. The Garden, therefore, has been given herbarium and library material of a total appraised value of $6,686.71, or an average of $1,114.45 per year from 1893 to 1898, inclusive, for which period only records have been kept, and this may be regarded as a certain equivalent for the publications actually distributed.

In addition to this library and herbarium material, the Garden has further received each year a considerable number of plants and seeds which have been presented by

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* Rept. 9 : 10.
† Rept. 10 : 9.
‡ Rept. 8 : 24.
§ Rept. 9 : 14, 15.
‖ Rept. 10 : 17, 19.

botanical gardens and other institutions. Up to the preparation of the Eighth Report,* this material was classed as having been received in exchange for Garden plants and seeds, the value of which, during a few years, considerably exceeded that of the receipts.† In point of fact, however, its value of late has been much in excess of the value of the plants and seeds which the Garden has distributed to its correspondents, and, as it has come, in large part, from botanical gardens which publish nothing excepting a small seed catalogue, from which they invite their correspondents to make selections, it may properly be regarded as replacing herbarium or printed exchange equivalents. In 1897,‡ the appraised value of presented plant and seed accessions was $1,204.29, and of similar material given out, $220.00, leaving $984.29 which may properly be added to the herbarium and library additions received in exchange for Garden publications. In 1898,§ the corresponding material shows: accessions, $1,317.68, distributions, $111.80, leaving a balance of $1,205.88 applicable in the same way. For these two years, therefore, it may be said that the average return for the Garden publications is properly $2,468.72 per year. These results are especially gratifying because, while avoiding waste, the intention has always been to secure the distribution of the Garden Reports to permanent botanical libraries where they are likely to be of use, regardless of the receipt of any equivalent.‖

In 1893,¶ the Board authorized the preparation of a small handbook, which might be placed on sale at the gate, at the approximate cost of publication, namely, twenty-five cents per copy. Eight copies of this handbook were given away and 192 sold, in 1898, making a total of 200 copies for the year, up to the end of which 2,362 copies had been disposed of, or an average of 393 for each of the six years 1893–98 inclusive.

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* Rept. 8 : 17.
† Rept. 4 : 12. 5 : 12.
‡ Rept. 9 : 12.
§ Rept. 10 : 16.
‖ Rept. 8 : 24.
¶ Rept. 5 : 17. 8 : 25.

As indicating the extent to which exchange relations have been established, I hope to be able to print in the Tenth Report a list of the periodical publications received at the Garden library, indicating, in an intelligible manner, those which are received in exchange for our own publications. From data obtained for the preparation of such a list, it appears that the periodical publications now received number 930, of which 840, issued by 660 institutions, and ranging in value from the bulletins of agricultural experiment stations, intended for gratuitous distribution within the States where they are printed, to the superb Annals of the Royal Botanic Garden, Calcutta, the last volume of which has a selling price of nearly $50.00, are presented to the library.

In 1891, the only year when a statement on this point was published, 185 exchanges were reported.*

That the facilities accumulated under the provisions of Mr. Shaw's will might be utilized, not only by Garden employees, but by all competent persons, the Director was some years since instructed to issue, from time to time, a circular calling attention to these facilities, and, under suitable simple restrictions, offering them to professors of botany and others competent to carry on independent investigation at the institution.† From year to year the extent to which visiting botanists have availed themselves of the privilege so offered has been indicated to the Board, and material for the herbarium and library has always been freely loaned to responsible specialists.‡ Through a considerable part of 1898, one or more persons not in the regular employ of the Garden have occupied research tables here, one of them in the prosecution of work for the Doctor's degree in Washington University; and short visits to the institution have been made by a number of workers from a distance.

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* Rept. 3 : 16.

† Rept. 7 : 19. 8 : 22, 42.

‡ Rept. 7 : 19. 8 : 22. 9 : 17.

As has been reported each year,* the expressed intention of the founder of the Garden that the instruction of garden pupils should not be neglected, has received the attention of the Board and the Director. One pupil, who would have completed his course in April last, was excused from further work in February and admitted to examination by the Garden Committee, that he might accept a desirable position, his certificate, however, being withheld until such time as he should have presented a thesis needed for the completion of his course. The vacancy created by his withdrawal was filled by the appointment of Mr. Ernest P. Field, a candidate nominated by the State Horticultural Society of Missouri; and with the beginning of the class year, in April last, Mr. Rudolph J. Mohr, of Omaha, Nebraska, was admitted as a paying pupil, under the provisions made by the Board. It is expected that in March next two pupils who are now in the fourth year will complete their work and receive the Garden certificates; and in anticipation of this event, a ninth announcement concerning garden pupils, comparable with those already issued, was distributed to individuals and the horticultural press, in November last. The course of study provided for garden pupils is the same as that already announced in various volumes of the Garden Report,† with the exception that this year one exercise per week in botanical geography has been added to the last trimester of the fourth year. The course, as now adopted, is indicated in the appended table.

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* See, especially, Rept. 1 : 37, 94. 8 : 25.

† Rept. 8 : 30.

COURSE OF STUDY.

YEAR.	TERM.	STUDIES.					PER WEEK.
SECOND.	April to June.	Floriculture. 3 exercises weekly.	Economic Entomology. 1 exercise weekly.		Surveying. 2 exercises weekly.		6
	July to Sept.	Floriculture. 3.	Economic Entomology. 2.	Book-Keeping. 1.			6
	Oct. to Dec.	Floriculture. 1.	Economic Entomology. 2.		Surveying. 1	Elementary Botany. 3	7
	Jan. to Mar.	Floriculture. 1.	Twigs of Woody Plants. 1.	Orchard Culture. 1.	Landscape Gardening 1	Elementary Botany. 3	7
THIRD.	April to June.	Vegetable Gardening 4			Landscape Gardening 1	Botany of Wild Flowers. 2	7
	July to Sept.		Economic Mycology. 1	Orchard Culture. 2	Landscape Gardening 1	Botany of Garden Flowers. 2	6
	Oct. to Dec.		Economic Mycology. 3	Garden Accounts. 1	Botany of Fruits. 2		6
	Jan. to Mar.		Economic Mycology. 3	Garden Accounts. 1		Botany of House Plants. 2	6
FOURTH.	April to June.	Orchard Culture. 1	Forestry. 1	Book-Keeping. 1	Surveying and Drainage. 3		6
	July to Sept.	Small Fruit Culture. 4			Botany of Weeds. 1	Botany of Vegetables 1	6
	Oct. to Dec.	Special Gardening 2	Forestry. 1	Vegetable Physiology 2		Botany of Woody Plants. 2	7
	Jan. to Mar.	Special Gardening 2	Forestry. 1	Vegetable Physiology 2	Botanical Geography 1	Botany of Ferns. 1	7

The 77 class exercises per week here tabulated (each extending over three months), may be grouped under subjects as follows: —

Gardening:			
Floriculture	8		
Vegetable gardening	4		
Fruit culture	8		
Forestry	3		
Landscape gardening	3		
Selected thesis work	4	30	
Surveying and drainage		6	
Bookkeeping and accounts		4	
Economic entomology		5	
Botany in its relation to gardening:			
General botany	8		
Botany of decorative plants	5		
Botany of hardy woody plants	3		
Botany of fruits	2		
Botany of vegetables	1		
Botany of weeds	1		
Botanical geography	1		
Economic mycology	7		
Vegetable physiology	4	32	77

All of the subjects capable of being taught in the laboratory, the greenhouse, or the field, are so taught, and all of the theoretical instruction is expected to be practically tested in the performance of the manual work required of students, the object being to make practical gardeners and not botanists or other scientific specialists of garden pupils.

In addition to the matters directly connected with the administration of the Garden, the will of its founder provides for the removal of his city residence to the vicinity of the Garden;* the erection of a convenient residence for a curator of the mausoleum, the museum and the adjoining grounds;† and four annual events:‡ the preaching of a sermon "on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the vege-

* Rept. 1: 43. † Rept. 1: 50. ‡ Rept. 1: 49.

THE HERBARIUM BUILDING.

table kingdom;" a "banquet to the Trustees of the Garden, and to the guests they may invite, literary and scientific men, and friends and patrons of the natural sciences;" a "banquet to the gardeners of the institution, and invited florists, nurserymen, and market gardeners of St. Louis and vicinity;" and the award of "premiums or prizes to a flower show or exhibition, when such flower show may be established by amateurs and horticulturists of St. Louis."

The removal of the late city residence of Mr. Shaw, which was effected in 1891, and the utilization of this building for the administrative offices, the library and the herbarium, has been noted in earlier reports.* How this building, while retaining its distinctive character and present internal arrangement, may ultimately be connected with and utilized in the system of administrative and research buildings which will be developed about it, has already received the attention of the landscape gardeners, and in due time must be studied in detail by competent architects.

The provision of a cottage to be used as a residence for a person who should act as curator of the mausoleum, etc., received the attention of the Board in 1895, and has likewise been mentioned in the Garden Reports.†

The annual flower sermon has each year been delivered in Christ Church Cathedral, St. Louis, by a prominent clergyman of the Episcopal Church, and annually reported on.‡ In 1898, the sermon was preached on the morning of May 15, by the Rt. Rev. Leighton Coleman, D.D., LL.D., of Wilmington, Delaware.

The annual banquet to the Trustees of the Garden and their invited guests, on which a report has each year been made,§ has resulted in bringing the Garden in close touch

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* Rept. 3:15. 7:7, 17. 8:19. † Rept. 7:7, 17.

‡ Rept. 1:103. 3:18, 21. 4:19, 23. 5:18, 23. 6:3, 17. 7:21. 8:34. 9:18.

§ Rept. 1:112. 3:18, 36. 4:19, 36. 5:18, 38. 6:17. 7:21. 8:34. 9:18.

with a considerable number of prominent investigators and educators through the United States and the adjacent British possessions. The banquet for 1898 was given at the St. Nicholas Hotel, St. Louis, on the evening of May 14. Dr. John Green presided. Sixty-four persons were present. The speakers were Dr. F. H. Snow, Chancellor of the University of Kansas, Rt. Rev. Leighton Coleman, Bishop of the Episcopal diocese of Delaware, Professor Conway MacMillan, of the University of Minnesota, and Hon. C. P. Walbridge, of St. Louis.

The annual banquet to the gardeners of the institution and invited florists, nurserymen and market gardeners,* has resulted in bringing together, each year, the most prominent workers in horticulture in St. Louis and a considerable number of active and distinguished horticulturists from a distance. The banquet for 1898 was given at the Mercantile Club, on the evening of November 19. Covers were laid for one hundred persons, among whom, in addition to the gardeners and office staff of the institution, and representative local horticulturists, were several officers of the State Horticultural Society of Missouri, the President-elect of the Society of American Florists, the Superintendent of Public Instruction of Missouri, the Superintendent of Instruction of St. Louis, and representatives of the horticultural press. The Director of the Garden presided, and Professor E. A. Engler, President of The Academy of Science of St. Louis, officiated as toastmaster. The speakers of the evening were W. N. Rudd, of Chicago, President-elect of the Society of American Florists; George B. Lamm, of Sedalia, Missouri, Chairman of the Committee on Horticultural Education of the State Horticultural Society of Missouri; F. L. Soldan, Superintendent of Instruction of St. Louis; L. A. Goodman, Secretary of the State Horticultural Society of Mis-

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* Rept. 2:35. 3:18, 57. 4:19, 44. 5:18. 6:19. 7:21. 8:34. 9:18.

souri; Wilbur S. Jackman, Professor of Nature Study in the Chicago Normal School; Levi Chubbuck, Editor of Colman's Rural World; and John R. Kirk, Superintendent of Public Instruction of Missouri. The principal effort of the evening was concentrated on the discussion of a proposition to introduce the study of horticulture into the public schools, which was presented by Mr. Lamm and seconded by all of the speakers following him.*

In providing for annual premiums for a flower show or exhibition, Mr. Shaw's intention was obviously to stimulate the holding of horticultural exhibitions in St. Louis, at which the public might become familiar with the better class of plants suitable for decorative cultivation. Thus far, these premiums have been offered and awarded by the officers of an annual chrysanthemum show held under the auspices of the St. Louis Florists' Club.† In 1898, the premiums were awarded at the chrysanthemum show held in the Coliseum of the Exposition building, St. Louis, from November 8 to 12 inclusive. The classes of plants for which the premiums were awarded were essentially the same as in former years, excepting that a small part of the Shaw fund was this year used for premiums for native plants, represented by herbaria prepared and exhibited by the pupils of the schools of St. Louis and St. Louis County. The provision that could be made for this feature of the flower show, from the Shaw fund, was supplemented by a generous sum placed at the disposal of the Florists' Club by Miss Mary Lionberger, for similar premiums; and, although the exhibition of herbaria was less extensive than might have been wished, enough was done to show the feasibility of awakening an interest in our wild plants, not only in the public, to whom these flowers are presented in herbarium form, but among the pupils in the schools,—

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* The proceedings on this occasion are reported in Colman's Rural World of December 1, 8 and 15, 1898.

† Rept. 5: 18. 6: 20. 7: 22. 8: 35. 9: 18.

results which have already been obtained in a similar manner, as well as by securing displays of blooming wild plants at various times through the season, by, for instance, the Massachusetts Horticultural Society.

To further secure the ends for which the premiums are offered, the Board of Trustees, in 1893, established a medal "to be known as the Henry Shaw Medal for the introduction of a valuable plant, and to be awarded each year, when practicable, for a new plant of value for cultivation, exhibited in St. Louis, as a part of the premiums or prizes to a flower show or exhibition provided for in the will of the late Henry Shaw; provided that the judges or other persons making awards at such exhibition shall certify that *said medal is awarded for a plant of decided merit for cultivation, not previously an article of North American commerce, and introduced to such commerce by the exhibitor during the year in which said award is made.*" * This medal has but twice been awarded: in 1893,† and in 1897,‡ On the occasion of each of the other flower shows, none of the plants exhibited were considered by the judges worthy of an award. It is hoped that, as time goes on, this medal, the award of which is intended to be restricted to really meritorious plants, may be the means of securing the early exhibition in St. Louis of plants which would otherwise make their appearance here at a considerably later date. It is to be regretted that the medal should have been so little sought for as yet, since in 1898, even, at least two plants were introduced to the American trade which were eminently worthy of receiving the award, and which it would have been perfectly practicable for the introducers to have exhibited in St. Louis in competition for it, — namely, *Acalypha hispida*§ (*A. Sanderi* of most floricultural writers) and *Dracaena surculosa*‖ (*D. Godseffiana* of the trade).

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* Rept. **5**: 18, 19. † Rept. **5**: 19. ‡ Rept. **9**: 19.

§ André, Revue Horticole. **70**: 456. *pl.*

‖ Garden. **51**: 298. *pl. 1115.*

THE GOOSE FLOWER.

THE SCHOOL OF BOTANY.

Some years before his death, in furtherance of his wish that botanical instruction and research should be pursued in St. Louis, Mr. Shaw endowed, as a department of Washington University, what is known as the Henry Shaw School of Botany, deeding to the University, for the support of this department, a piece of improved real estate in the business part of St. Louis.* In his will, made public after his death, Mr. Shaw refers to the purposes for which this gift was made (this portion of his will having been drafted, evidently, before the transfer was effected), and bequeaths to the University the endowment property already indicated, providing, further, that, in case of the depreciation of the property to an extent reducing the net revenue below a certain sum, the deficit shall be made up from the endowment funds of the Garden.†

At various points in his will, the founder of the Garden and School of Botany refers to the School of Botany, and indicates his intention that its relations with the Botanical Garden shall be very close, in such manner as to secure the co-operation of the two establishments, provision being made, even, for the increase in the means and appliances of instruction from time to time, when this may be expedient in the judgment of his Trustees.‡

In each of the annual Reports of the Garden has been incorporated a statement concerning the School of Botany, that in the First Report § being a quinquennial report of progress.

During 1898, the regular instructional force of the School of Botany remained as announced in my last report.‖ In addition to the courses given to undergraduates, resident work was provided at the Garden for one candidate for the Doctor's degree, during the early and the

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* Rept. 1 : 56.
† Rept. 1 : 36.
‡ Rept. 1 : 37.
§ Rept. 1 : 84.
‖ Rept. 9 : 19.

closing months of the calendar year, and one other person was admitted to candidacy, under the rules of the University, in the autumn. Popular classes were conducted at the Garden by Miss Ellen C. Clark, of the Mary Institute, during the spring months. No considerable addition has been made to the equipment of the School as reported two years since,* and the courses of study offered as electives in the undergraduate department of the University remain essentially as at that time.

In furtherance of the intention of its founder, the School has always devoted as much attention as was practicable to the furtherance of investigation, both on the part of advanced students and of the instructional force. In the Eighth Report † was published a list of scientific publications from the School, including a series of nine "Contributions from the Shaw School of Botany." Since the publication of that list, three additional numbers of this series have appeared: 10, von Schrenk, Hermann. The Trees of St. Louis as Influenced by the Tornado of 1896. 11, von Schrenk, Hermann. On the Mode of Dissemination of Usnea barbata. 12, Pammel, L. H. The Histology of the Caryopsis and Endosperm of some Grasses.

As was noted in the Eighth Report,‡ it is a matter for congratulation that nearly all of the persons who have served as assistants or instructors in the School of Botany, have assumed responsible botanical positions on leaving it.

Very respectfully,

WILLIAM TRELEASE,
Director.

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* Rept. 8:47. † Rept. 8:229. ‡ Rept. 8:50.

AN AGAVE CORNER.

SCIENTIFIC PAPERS.

NOTES ON THE GRASSES IN THE BERNHARDI HERBARIUM, COLLECTED BY THADDEUS HAENKE, AND DESCRIBED BY J. S. PRESL.

BY F. LAMSON-SCRIBNER.

In the Bernhardi Herbarium, which, through the earnest solicitations of the late Dr. George Engelmann, was acquired by the founder of the Missouri Botanical Garden,* are a large number of the specimens which represent the types or co-types of the species described by J. S. Presl in C. B. Presl's Reliquiae Haenkeanae. This collection is especially valuable to American botanists, as it includes a large number of American species, and has recently become even more interesting to the student of American plants as it embraces very many species of our newly acquired territory in the far East — the Philippine Islands. Through the courtesy of the Director of the Missouri Botanical Garden, Dr. Wm. Trelease, I have been enabled to examine these grasses, of which 121 species of the 334 described by Presl are represented in this collection. It may be of interest to note here that of the species described by Presl, 153 are found on the Pacific Coast of North America, most of them having been collected in Mexico, a few at Monterey, California, and a limited number at Nootka Sound; 102 species are from South America, chiefly from Peru; 56 species are from the Philippine Islands, chiefly from Luzon. The localities of 15 or 20 more species described by Presl were unknown to him.

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* Rept. Mo. Bot. Gard. 2 : 23. 8 : 19.

Presl described 15 new genera, of which three are now retained, viz.: *Pereilema*, *Epicampes*, and *Cathestecum*. The others have either been reduced to other genera or had previously been characterized. He described as new 334 species of grasses, and very many of these are now maintained as good species. Some have been reduced to varieties of other species, while not a few had already been published by older authors.

The volume of Reliquiae Haenkeanae, in which the grasses are described, was published in 1830, and very naturally contains the original descriptions of a large number of new species. The work now is quite inaccessible to ordinary students; it has long been out of print and copies when obtainable are expensive. It is hoped, therefore, that the present paper illustrating some 68 types of Presl's species of grasses, with the notes concerning some, will be of interest to American botanists. Only those species represented in the Bernhardi herbarium are referred to below. The citations of habitats are those given by Presl.

I would briefly call attention to a few of the species in the list enumerated.

Bromus secundus Presl is a variety of *Festuca rubra* with rather densely pubescent flowering glumes, found in Alaska.

Bromus virgatus is *Gouinia virgata* Scribn. = *Gouinia polygama* Fourn.

Paspalum kora Willd. = *Paspalum scrobiculatum* Linn., a species represented in the United States by No. 5760 A. H. Curtiss, 1896, collected at Jacksonville, Florida.

Poa secunda Presl appears to be without doubt *Sclerochloa californica* Munro, which has heretofore included a large number of varieties or forms and a few species which botanists did not well know what to do with. The species of this group have recently been defined in Circular No. 9, Division of Agrostology, U. S. Department of Agriculture.

Podosaemum distichophyllum is not the *Muhlenbergia distichophylla* of all recent collections, but *Muhlenbergia grandis* Vasey; which name, of course, now becomes a synonym.

These are a few of the points which this valuable collection has enabled us to settle and I only regret that we are unable to examine the entire collection.

AGROSTIS CAESPITOSA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 237 (1830). "Hab. in Peruvia?" = *Calamagrostis caespitosa* (Presl), not *C. caespitosa* Steud. *Bromidium caespitosum* Nees & Meyen in Nov. Act. Nat. Cur. **19**. Supplement 155. *Agrostis preslii* Kunth Enum. Pl. **1**: 225.—Plate 32.

AGROSTIS RIGESCENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 237 (1830). "Hab. in Peruvia?" = *Calamagrostis rigescens* (Presl) Scribn. *Bromidium rigescens* Nees & Meyen l. c.—Plate 32.

AGROSTIS TOLUCCENSIS HBK., Presl Reliq. Haenk. **1**: 237 (1830). *A. toluccensis* HBK. Nov. Gen. et Sp. **1**: 135. "Hab. in Peruviae montanis huanoccensibus." = No. 3373 H. Pittier, Costa Rica, 1891, except for the longer flaccid leaves of this, which Hackel calls var. *flaccifolia*.—Plate 33.

ALLOTEROPSIS DISTACHYA J. S. Presl in C. B. Presl Rel. Haenk. **1**: 344. *tab. 47*. "Hab. ad Monte-Rey in California." This is *Panicum semialatum* R. Br., an Australian grass. Kunth refers the species to *Urochloa*. The locality cited by Presl is doubtless an error. The ticket on the specimen in the Bernhardi herbarium indicates that it was collected in Luzon. In one of the spikelets there was found a spikelet of an Andropogon closely wedged between the glumes. The artist at first thought that this spikelet really belonged to the specimen and accordingly drew it (fig. f. plate 23). Presl's artist made the same mistake and Presl was also deceived by the

presence of this foreign spikelet to the extent of establishing his supposed new genus (*Alloteropsis*).—Plate 23.

ANDROPOGON ALTERNANS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 342 (1830). "Hab. in Peruvia." = *Andropogon micranthus* Kunth Revis. Gram. **1**: 165; Enum. **1**: 504. *A. parvispica* Steud. *Chrysopogon violaceus* Trin. The locality given by Presl (Peru) is probably an error as the species belongs to the eastern hemisphere. It occurs in Australia, China, and the Philippines.

ANDROPOGON FUSCUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 342 (1830). "Hab. in Luzonia." = *Andropogon serratus β nitidus* Hackl. in DC. Monog. Phan. **6**: 521. *Sorghum nitidum* Pers. Synops. **1**: 101.

ANDROPOGON GRACILIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 336 (1830). "Hab. in montanis Peruviae huanoccensibus." = *Andropogon tener* Kunth Revis. Gram. **2**: 565.

ANDROPOGON MALACOSTACHYUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 337. — "Hab. ad Acapulco." Guatemala and Costa Rica ex Hack. *A. malacostachyus* Fourn. Pl. Mex. **2**: 62 is *A. hirtiflorus* var. *oligostachyus* Hack. *A. oligostachyus* Chapm. — Plate 3.

ANDROPOGON TENELLUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 335. = *A. brevifolius* Sw. Prod. Fl. Ind. Occ. 26. — "Hab. in Mexico." This species is distributed throughout the tropical and sub-tropical regions of both hemispheres. No. 1771, Pringle, from Mex. (1888) in Natl. Herb. — Plate 2.

ANTHEPHORA VILLOSA Spreng., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 325 (1830). "Hab. in Mexico ad Acapulco." = *A. elegans* Schreb. Beschr. Graes. **2**: 105. *t. 44.*

ARISTIDA LONGIRAMEA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 224 (1830). "Hab. in Mexico." — *Aristida appressa* Vasey Contrib. Natl. Herb. **1**: 282 (1893) is the same. — Plate 26.

ARISTIDA NIGRESCENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 223 (1830). "Hab. in Mexico." = 501a E. Palmer 1886 coll.,. from Mexico. — Plate 27.

AVENA PILOSA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 253 (1830). "Hab. in Cordilleris chiliensibus." = *Trisetum subspicatum* Beauv. — Plate 38.

BERCHTOLDIA BROMOIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 324. *t. 43*. (1830)." Hab. in Mex." = *Chaetium bromoides* Benth. in Journ. Linn. Soc. **19**: 46. (1881).— Plate 25.

BRIZOPYRUM BOREALE J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 280 (1830). "Hab. in sinu Nootka." = *Distichlis spicata* (L.) Greene. — Plate 48.

BRIZOPYRUM PILOSUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 280 (1830). "Hab. ad Acapulco." = *Jouvea pilosa* (Presl) Scribn., staminate plant only. — Plate 48.

BROMUS SECUNDUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 263 (1830). "Hab. in sinu Nootka." = FESTUCA RUBRA SECUNDA (Presl) Scribn. new name. *Festuca rubra arenaria* ex char. Grisebach in Ledeb. Flor. Ross. *F. arenaria* Rupr. is cited by Grisebach as a synonym. It is not *F. arenaria* Lam. Specimens of this species are in the National Herbarium, and range from Alaska southward to Oregon. — Plate 52.

BROMUS SETIFOLIUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 261 (1830). "Hab. in Cordilleris chiliensibus, in Mexico?" This species does not appear in any of our recent Mexican collections. — Plate 52.

BROMUS VIRGATUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 263 (1830). "Hab. in montanis Peruviae, in Mexico?" = *Gouinia virgata* (Presl) Scribn. U. S. Dept. Agr. Div. Agrost., Bull. 4: 10 (1897). *Gouinia polygama* Fourn. *Festuca fournieriana* Hemsl.

CALOTHECA MICROSTACHYA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 268 (1830). "Hab. in montanis Peru-

viae.'' = *Briza microstachya* Steud. Nom. ed. 2. **1**: 225 (1840). 477 Liebman from Mexico, referred by Fournier to *Chascolytrum subaristatum* Rupr. is the same.

CAMPULOSUS PLANIFOLIUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 287 (1830). "Hab. in Mexico." *Ctenium glandulosum* Scribn. & J. G. Smith in Bot. Gaz. **21**: 362. *pl. 29* (1896) is the same. — Plate 42.

CENCHRUS ALOPECUROIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 317 (1830). "Hab. . . . . ." There is in the National Herbarium a specimen collected at Callao by the Wilkes Exploring Expedition, which is identical with Presl's species. It is ticketed in Munro's handwriting *Cenchrus alopecuroides* HBK. Presl's *C. alopecuroides* appears to be too close to *C. myosuroides* HBK. for a clear separation.

CENTOTHECA LAPPACEA Desv., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 258 (1830). "Hab. in insula Luzon, et in insulis Marianis." = *Centotheca lappacea* Desv. in Nouv. Bull. Soc. Philom. **2**: 189 (1810). *Cenchrus lappaceus* Linn. Tropical regions of both hemispheres.

CERATOCHLOA HAENKEANA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 285. "Hab. in Cordilleris chiliensibus, inque montanis Peruviae." = *Bromus unioloides* HBK. Nov. Gen. et Spec. **1**: 151. — Plate 54.

CHASCOLYTRUM SPICIGERUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 282 (1830). "Hab. in Peruviae montanis et in Chili." = *Briza spicigera* Steud. Nom. ed. 2. **1**: 225. — Plate 49.

CHLORIS ALBA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 289. "Hab. in Mexico." = *Chloris elegans* HBK. Of "*C. alba*" there is but a fragment showing only the inflorescence and a bit of the culm. On the sheet there is a good specimen of *C. truncata* R. Br. which is the species shown in the illustration. — Plate 41.

CHLORIS GRACILIS Durand Chlor. 10, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 289 (1830). "Hab. in Panama,

Mexico.'' = *Chloris radiata* Sw. Flor. Ind. Occ. **1**: 201. Kunth Gram. **2**. *t. 179*.

CLOMENA PERUVIANA Beauv., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 232 (1830). "Hab. in Mexico." = *Muhlenbergia clomena* Trin. Unifl. 194. *Clomena peruviana* Beauv. Agrost. 28. *t. 7. f. 10*.

CYNODON ARCUATUS J. S. Presl in C. B.Presl Reliq. Haenk. **1**: 290 (1830). "Hab. in Luzonia." — Plate 40.

CYNODON LINEARIS Willd., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 290 (1830). "Hab. in Luzonia." = *Cynodon dactylon* Pers. Syn. Pl. **1**: 85.

CYNODON TENER J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 291 (1830). "Hab. ad Sorzogon Luzoniae." I would refer this grass to *Chloris* sect. *Eustachys*. C. TENER (Presl) Scribn. new name. Very close to small forms of *C. petraea* Sw. — Plate 40.

DESCHAMPSIA CALYCINA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 251 (1830). "Hab. ad Monte-Rey Californiae." = *Aira danthonioides* Trin. in Act. Hort. Petrop. (1830). — Plate 37.

DEYEUXIA DENSIFLORA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 247 (1830). = *Calamagrostis densiflora* Steud. Nom. ed. 2. **1**: 250. "Hab. in Peruviae montanis huanoccensibus." See *Deyeuxia intermedia*. — Plate 35.

DEYEUXIA FUSCATA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 249 (1830). = *Calamagrostis fuscata* Steud. Nom. ed. 2. **1**: 250. "Hab. in Peruviae montanis huanoccensibus." — Plate 36.

DEYEUXIA INTERMEDIA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 249 (1830). "Hab. in montanis huanoccensibus Peruviae." = *Calamagrostis intermedia* Steud. Nom. ed. 2. **1**: 250, not *C. intermedia* Lindb. ex Nym. Consp. 799. From the specimens in the collection it is not possible to distinguish this species from *Calamagrostis densiflora* Steud.

DEYEUXIA OVATA J. S. Presl in C. B. Presl Reliq.

Haenk. **1**: 246. "Hab. in montanis Peruviae huanoccensibus." = *Calamagrostis ovata* Steud. Nom. ed. 2. **1**: 251. — Plate 35.

DEYEUXIA TOLUCCENSIS HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 249 (1830). "Hab. in Peruviae montanis huanoccensibus." Label on spec. in Herb. Bernhardi, Mo. Bot. Garden, reads *β glabra*. = *Calamagrostis toluccensis* Trin. ex Steud. Nom. ed. 2. **1**: 250.

DIECTOMIS ANGUSTATA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 333 (1830). "Hab. in Mexico." = *Andropogon apricus* Trin. in Mem. Acad. Peters. VI. **4**: 83 (1836). The species appears to have first been published by Nees in Agrost. Bras., p. 340, under the name of *Diectomis laxa*, a name already occupied in *Andropogon*. There is not the same objection to *angustatus* which was taken up by Steudel, and ought to be retained. — Plate 4.

DIECTOMIS FASTIGIATA Beauv., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 332 (1830). "Hab. in Mexico." = *Andropogon fastigiatus* Sw. Prodr. p. 26. *Diectomis fastigiata* Humb. et Bonpl. ap. Willd. Spec. **4**: 741; Kunth in HBK. Nov. Gen. et Sp. **1**. *t. 64*, excl. cit. Beauv.

"DINEBA BROMOIDES HBK.," J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 292 (1830). "Hab. in Mexico, Guayaquil." The specimen represented in the collection is *Bouteloua curtipendula* (Mx.) Torr.

DINEBA CURTIPENDULA Cand., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 292 (1830). "Hab. ad Acapulco." = *Bouteloua curtipendula* (Mx.) Torr. in Emory's Report 153 (1848). *Chloris curtipendula* Michx. Fl. Bor. Am. **1**: 59 (1803). *Bouteloua racemosa* Lag. (1805).

DIPLACHNE BREVIFOLIA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 261 (1830). "Hab. in montanis Peruviae huanoccensibus." = *Festuca haenkei* Kunth Enum. Pl. **1**: 403. — Plate 43.

DIPLACHNE RIGESCENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 260 (1830). "Hab. in montanis Peruviae huanoccensibus." = *Festuca rigescens* Kunth Enum. Pl. **1**: 403. — Plate 43.

ELIONURUS CILIARIS HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 332 (1830). "Hab. in Mexico." = *E. tripsacoides* HBK. var. *ciliaris* Hack. in DC. Monog. Phan. **6**: 333. *E. ciliaris* Kunth in HBK. Nov. Gen. et Sp. **1**: 193. *t. 63*.

ERAGROSTIS ALBA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 279 (1830). "Hab. ad Monte-Rey, California." Apparently allied to, and possibly identical with *Poa pastoensis* HBK. See Kunth Gram. *t. 145*. — Plate 44.

ERAGROSTIS CILIARIS Link, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 274 (1830). "Hab. in Mexico, Panama."

ERAGROSTIS ELONGATA Jacq., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 275 (1830). "Hab. in Luzonia? in vallibus Cordillerarum Peruviae?" = *Eragrostis elongata* (Willd.) Jacq. Eclog. Gram. *t. 3*. *Poa elongata* Willd. Enum. **1**: 108. Allied to *E. brownei* Nees, but the flowering glumes are more acute.

ERAGROSTIS LURIDA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 276 (1830). "Hab. in montanis Peruviae." — Plate 45.

ERAGROSTIS PANAMENSIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 277. "Hab. in Panama." = *Eragrostis maypurensis* (HBK.) Steud. Nom. Pl. 2. 276. *Poa maypurensis* HBK. Nov. Gen. et Sp. **1**: 161. — Plate 47.

ERAGROSTIS REPTANS Nees, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 275 (1830). "Hab. in Mexico et Guayaquil." = *Eragrostis hypnoides* (Lam.) BSP. Prel. Cat. N. Y. 69 (1888). *Poa hypnoides* Lam.

ERAGROSTIS SECUNDIFLORA, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 276 (1830). — "Hab. in Mexico." *Eragrostis oxylepis* Nutt is the same.

ERAGROSTIS TENELLA Beauv., J. S. Presl in C. B. Presl

Reliq. Haenk. **1**: 274 (1830). "Hab. in Marianis insulis et in Luzonia ad portum Sorzogon." = *E. plumosa* Link Hort. Berol. **1**: 192. — Plate 44.

HETEROPOGON FIRMUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 334 (1830). "Hab. in Mexico." = *Andropogon contortus* var. *secundus* Hack. in DC. Monog. Phan. **6**: 587. *A. secundus* Willd. *A. allionii* HBK. and *A. firmus* Kth.

HEXARRHENA CENCHROIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 326. *tab. 45* (1830). "Hab. in Mexico." = *Hilaria cenchroides* HBK. Nov. Gen. et Sp. **1**: 117. The specimen represents a tall form with bearded nodes, scabrous leaves, and with the divisions of the outer glumes ciliate, *Hilaria cenchroides ciliaris* Scribn. in Proc. Acad. Nat. Sci. Phil. **1891**: 293. — Plate 5.

HIEROCHLOE ARCTICA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 252 (1830). "Hab. in sinu Nootka." = *Savastana odorata* (L.) Scribn. Identical with 391 Walter H. Evans from near Kadiak, Alaska, 1897, in National Herbarium.

HORDEUM COMOSUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 327 (1830). "Hab. in Chili." — Plate 54.

HORDEUM PRATENSE Huds., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 327 (1830) var. γ. "Hab in Cordilleris chiliensibus et Mexico." = *Hordeum secalinum* Schreb. Spicil. Flor. Lips. 148.

ISCHAEMUM POLYSTACHYUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 328 (1830). "Hab. in insulis Marianis." = *Ischaemum digitatum* β *polystachyum* Hack. in DC. Monog. Phan. **6**. Androp. p. 233. *Andropogon mariannae* Steud.

LEERSIA LUZONENSIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 207 (1830). "Hab. in insula Luzonia." = *Leersia hexandra* Sw. Prod. Veg. Ind. Occ. 21.

LEPTOCHLOA FILIFORMIS R. & S., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 288 (1830). "Hab. in Mexico, ad

Sorzogon, Luzoniae." = *Leptochloa mucronata* Kunth Revis. Gram. **1**: 91. — *L. filiformis* R. & S. = *L. cynosuroides* R. &. S.

LYCURUS PHALAROIDES HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 232 (1830). "Hab. in Mexico." = *L. phalaroides* HBK. Nov. Gen. et Sp. **1**: 142.

MANISURIS GRANULARIS Swartz, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 332 (1830). "Hab. in Mexico, Acapulco, Panama, California."

MEGASTACHYA PANICOIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 283 (1830). "Hab. in Mexico ad Acapulco, verosimiliter in lutosis." = *Eragrostis panicoides* Steud. — Plate 47.

MONOPOGON AVENACEUS J. S. Presl in C. B. Presl Reliq. **1**: 324. *t. 44* (1830). "Hab. in Mexico." = *Tristachya leiostachya* Nees Agrost. Bras. 459 (1829). — Plate 39.

NOWODWORSKYA AGROSTOIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 239 (1830).* "Hab. in Peruviae montanis huanoccensibus." = *Polypogon elongata* HBK. Nov. Gen. et Sp. **1**: 134 (1815), not Lagasca (1816). — Plate 31.

OPLISMENUS COLONUS HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 321 (1830). "Hab. in insula Luzon, Guaham." = *Panicum colonum* Linn. Syst. ed. 10. 87.

OPLISMENUS TENUIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 319 (1830). "Hab. in Mexico, Panama." = *Ichnanthus candicans* Doell in Mart. Flor. Bras. **2**²: 291. *Panicum candicans* Nees Agrost. Bras. **2**: 133(1829). — Plate 24.

ORYZA MINUTA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 208 (1830). "Habitata in insula Luzonia."

ORYZA SATIVA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 208 (1830). "Hab. in Mexico." An awnless variety.

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* In text, *Raspalia agrostoides*, but changed in "Addenda et corrigenda" p. 351, to *Nowodworskya*.

PANICUM AURITUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 305 (1830). "Hab. ad Sorzogon Luzoniae." First published by Nees ab Esenb. in Mart. Flor. Bras. **2**: 176. = No. 81 Flor. Singapore, in Natl. Herbarium. — Plate 15.

PANICUM BRIZAEFORME J. S. Presl in C. B. Presl Reliq. **1**: 302 (1830). "Hab. in Luzonia." = *Panicum paspaloides* Pers. Syn. **1**: 81 (1818). — Plate 16.

PANICUM CARINATUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 309 (1830). "Hab. in insula Luzonia ad Sorzogon; β. in Mexico?" This species has been referred to *P. trigonum* Retz. by Hackel (see specimen in Nat. Herb. from India, collected by Anderson). Another specimen in Nat. Herb. is from Assam, collected by the Reporter on Economic Products to the Government of India. In both of these specimens as well as in that of Presl the spikelets are glabrous while those of *P. trigonum* are described as having hispid outer glumes. A grass from China, collected by Ridley, and now in the Nat. Herb. under the name of *P. trigonum* Retz., has hispid outer glumes. The spikelets and general habit of this grass agree with those of *P. carinatum*, but the leaves are shorter and taper to an acute or narrow not a cordate base. *P. carinatum* Presl is certainly closely allied to and perhaps identical with *P. radicans* Retz., *P. accrescens* Trin. Icon. Gram. **8**. *t. 88*. — Plate 17.

PANICUM CONVOLUTUM Beauv., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 304 (1830). "Hab. ad Sorzogon Luzoniae." = *Panicum repens* Linn. Sp. Pl. ed. 2. 87. Tropical and subtropical regions of both hemispheres. No. 2879 Ridley in Natl. Herbarium from China (1893) is the same.

PANICUM FIMBRIATUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 298 (1830). This is the same as *Digitaria fimbriata* Link, which Nash retains as a species under *Syntherisma* (Bull. Torr. Bot. Club **25**: 302). By

most authors it has been reduced to *Panicum sanguinale* L. — Plate 18.

PANICUM HIRTICAULUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 308 (1830). "Hab. ad Acapulco, Mexico." Allied to *P. capillare* L. but quite distinct. It is not an uncommon grass in the southwestern United States. There is a specimen of this species in the National Herbarium collected in Washington, near Bingen, Klickitat Co., No. 2330 Suksdorf, 1894. — Plate 19.

PANICUM MILIIFORME J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 300 (1830). "Hab. in Luzonia." The specimen, of which there is only a fragment, suggests a close relationship to *P. marginatum* R. Br. It resembles that species in foliage, inflorescence, and general appearance of the spikelets, but is evidently quite distinct. — Plate 20.

PANICUM MULTINODE J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 303 (1830). "Hab. ad Sorzogon Luzoniae." = *P. nodosum* Kunth Enum. Pl. **1**: 97, not *P. multinode* Lam.

PANICUM MYURUS Meyer, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 313 (1830). "Hab. in Peruviae, Mexico, et ad Monte-Rey, California." = *Panicum amplexicaule* Rudge Guian. **1**: 21. *t. 27;* Trinius Sp. Gram. Icon. *t. 205*. No. 1030 Morong from Paraguay, in Natl. Herbarium is this species.

PANICUM PHLEIFORME J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 302. "Hab. in Mexico." No. 2363 C. G. Pringle 1889, distributed as *P. indicum* L., is *Panicum phleiforme* Presl. The two species are very closely related. — Plate 21.

PANICUM POLYRRHIZUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 296 (1830). "Hab. ad Monte-Rey Californiae." = *Paspalum distichum* L. — Plate 21.

"PANICUM PUBESCENS Lam." J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 306 (1830). 'Hab. in Nootka-Sund."

There are two specimens and two labels on the sheet. One, in Presl's handwriting, reads "*Panicum pubescens* Michx," and doubtless applies to the smaller specimen which is identical with specimens in the Nat. Herb. from Washington, *e. g.* No. 3978, A. A. & E. Gertrude Heller 1898. The other label reads "77 *Panicum pubescens* Ell. 1833, Beyrich." This applies to the second specimen which must have come from the southern or southwestern States, and is *Panicum angustifolium* Ell. The other specimen does not fully agree with any of our eastern species and may well be named P. OCCIDENTALE Scribn. nom. nov. *P. pubescens* Presl, not Lam. nor Michx.

PANICUM STIPATUM J. S. Presl in C. B. Presl Rel. Haenk. **1**: 297 (1830). "Hab. in Mexico, Luzon?" = *Syntherisma setosa* (Desv.) Nash. *Digitaria setosa* Desv. Hamil. Prod. Pl. Ind. Occ. **6** (1825). The spikelets in Presl's specimen are a very little (about 0.2 mm.) longer than in the West Indian plant represented by 764 C. Wright, but otherwise I can detect no difference. No. 3049 E. W. Nelson, from Chiapas, Mex., 1895, is the same. — Plate 22.

PANICUM TRICHANTHUM Nees, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 309 (1830). "Hab. in Mexico." = *Panicum brevifolium* Linn. Sp. Pl. 59. No. 1758 E. Palmer, Mexico, 1891.

PASPALUM ATTENUATUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 212 (1830). "Hab. in montanis Peruviae huanoccensibus." See *P. scoparium* Flügge. Properly belongs to *Syntherisma*. — Plate 8.

PASPALUM BRACTEATUM Presl in herb. *Paspalum bracteatum* is only a herbarium name, and the sheet thus ticketed contains two species, viz.: *P. firmum* Trin. Diss. **2**: 105, and Icon. *t. 125*, referred to *P. scrobiculatum* L. by many authors; and *P. longifolium* Roxb. Hort. Beng. 7; Trin. Icon. *t. 138*. This has also been referred to *P. scrobicula-*

tum by some, but it is abundantly distinct from that species. *P. firmum* is the species illustrated. — Plate 9.

PASPALUM CARTILAGINEUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 216 (1830). "Habitat in insula Luzonia ad Sorzogon, in Marianis." = *Paspalum scrobiculatum* L.

PASPALUM CONJUGATUM Berg., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 210 (1830). "Hab. in Mexico." *Paspalum conjugatum* Berg. in Act. Helv. **7**: 129. *t. 8* (1772); Trin. Icon. *t. 102*. All tropical regions.

PASPALUM COMPRESSUM (Swartz) Nees, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 212 (1830). "Hab. in Mexico." = *Milium compressum* Swartz Prod. 24.

PASPALUM FILIFORME Swartz, J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 214 (1830). "Hab. in Luzonia? Mexico." = *Syntherisma filiforme* (L.) Nash in Bull. Torr. Bot. Club **22**: 420 (1895). *Panicum filiforme* L. Doell in Mart. Flora Bras. refers *Paspalum filiforme* Swartz to *Paspalum caespitosum* Flügge.

PASPALUM FUSCESCENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 213 (1830). "Hab. ad Monte-Rey Californiae." = SYNTHERISMA FUSCESCENS (Presl) Scribn. new name. — Plate 10.

PASPALUM FUSCUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 214 (1830). "Hab. in Luzonia? in Peruviae montanis huanoccensibus? Mexico?" = SYNTHERISMA FUSCA (Presl) Scribn. new name. Presl was evidently in doubt as to the locality. South America is cited for the locality in the Kew Index. — Plate 11.

PASPALUM HUMBOLDTIANUM Flügge in C. B. Presl Reliq. Haenk. **1**: 217 (1830). "Hab. in Mexico." = *Paspalum humboldtianum* Flügge Gram. Monog. 67; HBK. Nov. Gen. et Sp. Pl. **1**: 86. *tab. 23*. Mexico and tropical America. No. 286 E. Palmer from Guadalajara, Mexico, 1886.

PASPALUM HAENKEANUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 210 (1830). "Hab. in montanis huanoc-

censibus Peruviae.'' This is *Paspalum mandiocanum* Trin. var. *a. ellipticum* Doell in Mart. Flor. Bras. **2**^{2}: 80, and is represented in the National Herbarium by No. 356 Loefgren (1887). The species is, I think, a good one and Presl's name should be retained. — Plate 12.

PASPALUM LENTIGINOSUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 218 (1830). ''Hab. in Mexico.'' E. Palmer's No. 1556 (1891) from Culiacan, Mexico, and distributed as *Paspalum paniculatum* L. is *P. lentiginosum* Presl. — Plate 13.

PASPALUM KORA Willd., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 216 (1830). ''Hab. in insulis Marianis et Philippinis.'' *Paspalum kora* Willd. Sp. Pl. **1**: 332; Hort. Berol. *t. 74.* = *P. scrobiculatum* Linn. Mant. **1**: 29. All tropical countries. Florida specimens referable to this species are 5760 A. H. Curtiss 1896 collected at Jacksonville, Aug. 24.

PASPALUM MOLLE J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 213 (1830). ''Hab. in Luzonia.'' = SYNTHERISMA MOLLE (Presl) Scribn. new name. *Paspalum mollicomum* Kth. Enum. Pl. **1**: 47. Allied to *Syntherisma serotina* Walt.

PASPALUM PUBESCENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 214 (1830). ''Hab. in regione montana Peruviana.'' = SYNTHERISMA PUBESCENS (Presl) Scribn. new name. *Paspalum preslii* Kunth Enum. Pl. **1**: 47. — Plate 10.

PASPALUM SCOPARIUM Flügge Monog. 125; J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 213. ''Hab. in Peruviae montanis huanoccensibus.'' Doell unites *P. attenuatum* Presl with this, but that species is quite distinct although nearly allied. It is a much smaller species with spikelets hardly half the size of those in *P. scoparium*.

PEREILEMA CRINITUM J. S. Presl in C. B. Presl Reliq.

Haenk. **1**: 233. *tab. 37. f. a* (1830). "Hab. in Panama." Not *P. crinitum* Trin. — Plate 29.

PIPTATHERUM PUNCTATUM Beauv., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 221 (1830). "Hab. in Mexico, Guajaquil." = *Eriochloa polystachya* HBK. Nov. Gen. et Sp. **1**: 95.

POA HOLCIFORMIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 272 (1830). "Hab. in Cordilleris chiliensibus." This grass has the habit and aspect of some of the species in the group containing *P. fendleriana* but is apparently distinct from any North American form. — Plate 50.

POA NOOTKAENSIS J. S. Presl in C. B. Presl. Reliq. Haenk. **1**: 272 (1830). "*Poa nutkaensis*" in the text. "Hab. in sinu Nootka? in Mexico?" There is a question of doubt on the part of Presl as to where the specimens were collected, but they certainly must have come from Nootka Sound, as the grass does not occur in Mexico. The species ranges on the Pacific Coast from Washington northward and on the Atlantic Coast from Mt. Desert off the coast of Maine northward to the Arctic regions. = *Puccinellia angustata* Nash in Bull. Torr. Bot. Club **22**: 512 (1895). *Poa angustata* R. Br. in Parry's First Voy. Suppl. 287 (1823). *Glyceria angustata* Fries. *Atropis angustata* Griseb. in Ledeb. Flor. Ross. — Plate 51.

POA SECUNDA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 271. "Hab. in Cordilleris chiliensibus." The specimen consists of the upper portion of the culm with uppermost leaf and panicle. Judging from this material I would without hesitation refer to *Poa secunda* No. 1122 Brewer, from California, and 2035 Hartweg also from California, which Munro named *Sclerochloa californica*. This is quite distinct from *Poa fendleriana* (Steud.) Vasey. — Plate 51.

PODOSAEMUM DISTICHOPHYLLUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 231 (1830). "Hab. in Mexico." = *Muhlenbergia distichophylla* Kunth Enum. Pl. **1**: 202.

Muhlenbergia grandis Vasey Contrib. U. S. Nat. Herb. **1**: 283 (1893) is identical with this species. The *Muhlenbergia* which is common in New Mexico and Arizona and which has been referred to *M. distichophylla* by most American authors (Vasey in Bot. Wheeler 283 and in Contrib. U. S. Nat. Herb. **3**: 66), is a very distinct species and may be named MUHLENBERGIA VASEYANA Scribn. new name. *M. emersleyi* Vasey in Contrib. Nat. Herb. **3**: 66 (1892) differs only in being somewhat more robust and in having the empty glumes distinctly longer than the flowering glume which is more hairy on the back. — Plate 28.

PODOSAEMUM TENUISSIMUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 230 (1830). "Hab. in Panama et in Mexico." = *Muhlenbergia tenuissima* Kunth Enum. Pl. **1**: 198. *Muhlenbergia nebulosa* Scribn., in Beal Grasses N. Am. **2**: 247 (1896) is a synonym. — Plate 29.

POGONOPSIS TENERA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 333. *tab. 46.* The locality "Hab. in Mexico" is probably an error as the grass is an East Indian species. Presl's specimens were probably collected in the Philippines. Hackel reduces *P. tenera* Presl to a variety of *P. saccharoideum* Beauv. *β monandrum* Hack. in DC. Monog. Phanerog. **6**: 193. *Pollinia monandra* Spreng., *Andropogon crinitus* Thunb. and *Pogonatherum refractum* Nees are synonyms. — Plate 2.

SACCHARUM SPICATUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 346 (1830). "Hab. in insula Luzonia." = *Imperata arundinacea* var. *koenigii* Hack. in DC. Monog. Phan. **6**: 94. *I. koenigii* Benth. Flor. Hongk. p. 419. — Plate 1.

SETARIA GLOBULARIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 314 (1830). "Hab. insularis Philippinis." There are three species on the sheet. One is CHAETOCHLOA CAUDATA (Lam.) Scribn. new name, *Panicum caudatum* Lam., and is matched in the Nat. Herb. by

specimens from the ballast grounds at Mobile and also from Brazil. One is *Chaetochloa composita* (Kth.) Scribn. and is represented in the Nat. Herb. by No. 1897 A. A. Heller, collected at Kerville, Texas, and by other Texan and Mexican specimens. The third specimen is not determinable.

SETARIA PENICILLATA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 314 (1830). "Hab. in Mexico." = *Panicum penicillatum* Willd. herb.; Nees. Agrost. Bras. p. 242. *Chaetochloa penicillatum* (Willd.) Scribn. Bull. U. S. Dept. Agr., Div. Agrostology 4: 39.

SPOROBOLUS CILIATUS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 242 (1830). "Hab. in Panama." — Plate 30.

SPOROBOLUS HUMILIS J. S. Presl in C. B. Presl Reliq. Haenk. **1**; 241 (1830). "Hab. in insula Luzonia." — Plate 30.

SPOROBOLUS REPENS J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 241 (1830). "Hab. in Mexico." *Vilfa repens* Trin. in Mem. Acad. Petersb. Sc. Nat. IV. **5**: 102 (1840) is a synonym. The grass is essentially *Vilfa utilis* Torr. Fournier separates this species, *S. repens*, from his *Vilfa saccatilla* by its elongated ligule. — Plate 30.

STREPTACHNE PILOSA HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 225 (1830). "Hab. ad Acapulco in Mexico." = *Aristida jorullensis* Kunth Revis. Gram. **1**: 62. Identical with No. 36 E. Palmer in Nat. Herb. from Mexico and distributed as *Aristida pilosa* (Nees), and No. 3334 H. Pittier from Rodeo de Pacaca, Costa Rica, 1891.

STREPTACHNE SCABRA HBK., J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 225 (1830). "Hab. in Mexico." = *Aristida scabra* Kth. Revis. Gram. **1**: 62.

THYSANACHNE PERUVIANA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 253 (1830). "Hab. in montanis huanoccensibus Peruviae." = *Arundinella deppeana* Nees in Bon-

plandia **3**: 84 (1855). *Arundinella crinita* Trin. in Linnaea **10**: 299 (1836), from Peru, may be the same. I have no material for comparison. *Arundinella peruviana* Steud. Syn. Gram. 115 is based upon Presl's *Thysanachne peruviana*. — Plate 6.

THYSANACHNE SCOPARIA C. B. Presl Thysan. Nov. Pl. Gen. (1829); et J. S. Presl in Reliq. Haenk. **1**: 253. = *Arundinella deppeana* Nees. "Hab. in Mexico." — Plate 7.

TRICHODIUM ALBUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 244 (1830). "Hab. in sinu Nutkaensis." = *Agrostis nutkaensis* Kunth Enum. Pl. **1**: 222. The specimen is fragmentary, but it is clearly the tall grass common in collections from Oregon and Washington which has been referred to *Agrostis scabra* Willd. or *A. laxiflora* Rich. — Plate 34.

TRICHODIUM NANUM J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 243 (1830). "Hab. in Peruvia?" = *Agrostis nana* Kunth Enum. Pl. **1**: 266. — Plate 34.

UROCHLOA PASPALOIDES J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 318 (1830). "Hab. in Luzonia ad Sorzogon." = *Panicum ambiguum* Trin. in Mem. Acad. Petersb. VI. **3**^{2}: 243 (1835). This grass is quite distinct from *Urochloa panicoides* Beauv. which has been cited as a synonym by some authors. — Plate 14.

UROCHLOA UNISETA J. S. Presl in C. B. Presl Reliq. Haenk. **1**: 319 (1830). = *Ixophorus unisetus* Schlecht. in Linnaea **31**: 420 (1861–62). *Panicum palmeri* Vasey. See Bull. U. S. Dept. Agr., Div. Agrost. 4: 6. *pl. 1* (1887).

VULPIA MYURUS Link, J. S. Presl in C. B. Presl. Reliq. Haenk. **1**: 260 (1830). "Hab. in montanis Peruviae." Three varieties are mentioned: *α* panicula simplicissima spicaeformi; *β* panicula simplici subspicaeformi. "Hab. as *α*"; *γ* panicula simplici subspicaeformi, paleis inferioribus ciliatus. "Hab. in Chili." There are three specimens on the sheet and neither one seems to be var. *β* = *Festuca myurus* Linn. Sp. Pl. 74.

XYSTIDIUM BARBATUM J. S. Presl in C. B. Presl Reliq. Haenk. 1: 228 (1830). "Hab. in insula Luzonia." = *Perotis rara* R. Br. Prod. 72.

EXPLANATION OF PLATES ILLUSTRATING PRESL GRASSES.

All of the illustrations, executed under my direction by Mrs. M. D. B. Willis, née Baker, unless otherwise stated were drawn from specimens in the herbarium of the Missouri Botanical Garden, labeled in Presl's handwriting, and unless otherwise noted the habit-sketches have been reduced one-half. The enlargement of the details is sufficiently indicated by the enlarged scale accompanying them.

Plate 1. ***Saccharum spicatum*** **Presl. Island of Luzone. — a, Spikelet; b, dorsal view of first glume; c, dorsal view of second glume; d, pistil; e, flowering glume; f, palea.**

Plate 2. 1, ***Pogonopsis tenera*** **Presl. Mexico. — a, A pair of spikelets; b, first glume; c, second glume; d, flowering glume; e, palea — all of the sessile spikelet. 2,** ***Andropogon tenellus*** **Presl. — a, Spikelet; b, first glume; c, second glume; d, third glume; e, flowering or fourth glume.**

Plate 3. ***Andropogon malacostachyus*** **Presl. Acapulco. Natural size. — a, Joint of the rachis with sessile and pedicellate spikelets; b, first glume; c, second glume; d, third glume; e, flowering glume; f, lodicules.**

Plate 4. ***Diectomis angustata*** **Presl. — a, Pair of spikelets showing joint of rachis and side view of sessile spikelet; b, pistillate spikelet; c, first glume; d, second glume; e, third glume; f, flowering glume; g, palea and lodicules; h, pistil; i, stamens — all belonging to the sessile and fertile spikelet; k, first glume; l, second glume; m, third glume; n, flowering glume; o, palea with stamens and lodicules — all belonging to the pedicellate and staminate spikelet.**

Plate 5. ***Hexarrhena cenchroides*** **Presl. Mexico. — a, Group of spikelets; b, lateral spikelets; c, lateral floret, outer glumes removed; d, e, outer glumes of the pistillate spikelet; f, pistillate floret; g, palea of same; h, pistil, most of the style removed.**

Plate 6. ***Thysanachne peruviana*** **Presl. High mountains of Peru. — a, Spikelet; b, third glume, inner view showing its palea; c, fertile flower.**

Plate 7. ***Thysanachne scoparia*** **Presl. — a, Spikelet; b, first glume; c, second glume; d, third glume; e, palea of third glume; f, flower; g, palea and lodicules.**

Plate 8. *Paspalum attenuatum* Presl.— a, Spikelet showing first glume; b, spikelet showing second glume; c, dorsal view of flowering glume; d, anterior face of flowering glume with inclosed palea; e, palea, lodicules, and stigmas.

Plate 9. *Paspalum bracteatum* Presl. — a, Spikelet showing first glume; b, spikelet showing second glume; c, back of flowering glume; d, opposite face of flowering glume showing inclosed palea; e, lodicules, palea, and stigmas.

Plate 10. 1, *Paspalum fuscescens* Presl. — a, Spikelet showing first glume; b, spikelet showing second glume; c, back of flowering glume; d, anterior view of flowering glume; e, palea and lodicules, the latter drawn outside the infolded edges of the palea. 2, *Paspalum pubescens* Presl. Monterey, Cal. — a, View of spikelet showing first glume; b, same showing second glume; c, dorsal view of flowering glume; d, anterior view of same.

Plate 11. *Paspalum fuscum* Presl. — a, Spikelet showing first glume; b, spikelet showing second glume; c, dorsal view of flowering glume; d, an interior view of flowering glume; e, palea and lodicules.

Plate 12. *Paspalum haenkeanum* Presl. — a, Spikelet showing first glume; b, spikelet showing second glume; c, dorsal view of flowering glume; d, palea, lodicules, and stigma.

Plate 13. *Paspalum lentiginosum* Presl. — a, Spikelet showing first glume; b, spikelet showing second glume; c, dorsal view of flowering glume; d, anterior view of flowering glume showing inclosed palea; e, palea, lodicules, and stigmas.

Plate 14. *Urochloa paspaloides* Presl. — a, Spikelet showing back of first glume; b, spikelet showing back of second glume; c, spikelet showing back of third glume, first being removed; d, inside of third glume with inclosed palea; e, back of flowering glume; f, opposite face of flowering glume with inclosed palea.

Plate 15. *Panicum auritum* Presl. Sorzogon Luzone. — a, View of spikelet showing first glume; b, view of spikelet showing third glume; c, lateral view of spikelet; d, dorsal view of fruiting glume; e, anterior view of palea showing lodicules, stigma, and stamens.

Plate 16. *Panicum trizaeforme* Presl. — a, Spikelet showing back of first glume; b, spikelet showing back of second glume; c, side view; d, palea and stamens of third glume, also lodicules; e, back of flower; f, opposite face of flower with inclosed palea.

Plate 17. *Panicum carinatum* Presl. — a, Spikelet showing back of first glume; b, spikelet showing back of second glume; c, side of spikelet; d, back of flower; e, opposite face of flower with inclosed palea.

Plate 18. *Panicum fimbriatum* Presl. Acapulco, Mexico. Monterey, Cal. — a, View of spikelet showing first glume and back of third glume; b, view of spikelet showing second glume, and part of the fourth or flowering glume; c, back of flowering glume; d, dorsal view of palea which is nearly inclosed by the margins of the flowering glume.

Plate 19. *Panicum hirticaulum* Presl. Acapulco, Mexico. — a, Spike-

let showing first glume; b, spikelet showing second glume; c, lateral view of spikelet; d, inner view of third glume, showing its palea; e, dorsal view of flowering glume; f, anterior view of floret showing palea.

Plate 20. *Panicum miliiforme* Presl. Luzone. — a, View of spikelet, showing first glume; b, view of spikelet showing the second glume; c, anterior view of third glume showing its palea; d, dorsal view of flowering glume; e, dorsal view of palea, which is partly inclosed by the flowering glume.

Plate 21. 1, *Panicum phleiforme* Presl. Mexico. Specimen fragmentary.—a, View of spikelet showing first glume and a part of third; b, view of spikelet showing second glume from the back; c, lateral view of spikelet; d, dorsal view of flowering glume; e, anterior view of same showing palea. 2, *Panicum polyrrhizum* Presl. Monterey, Cal. — a, View of spikelet showing first glume; b, view of spikelet showing second glume; c, dorsal view of flowering glume; d, anterior view of first spikelet, the outer glumes removed showing palea; e, inner view of palea showing lodicules and stamens.

Plate 22. *Panicum stipatum* Presl. — a, Spikelet showing very minute first glume; b, spikelet showing second glume; c, back of flowering glume; d, opposite face of flowering glume with inclosed palea, showing also attached palea of third glume.

Plate 23. *Alloteropsis distachya* Presl. Monterey, Cal. — a, Spikelet showing first glume; b, view of the spikelet showing second glume; c, anterior face of second glume; d, palea, lodicules, and stamen of the staminate flower; e, fertile flower. —f, Joint of a rachis, a sessile spikelet and a pedicel of a pedicellate spikelet of some species of *Andropogon*. This spikelet, from which this drawing was made, was found only in one instance, inside the third glume, occurring there through some accident doubtless. It was upon this supposed compound spikelet that Presl based his genus *Alloteropsis*. The grass, however, is a species of *Panicum*.

Plate 24. *Oplismenus tenuis* Presl. Mexico, Panama. — a, Entire spikelet; b, inner view of third glume showing its palea; c, back of flower; d, anterior view of same.

Plate 25. *Berchtoldia bromoides* Presl. — a, Side view of spikelet; b, back of spikelet showing first glume; c, opposite view of palet, showing second glume; d, third glume; e, back of flower; f, opposite view of flower showing inclosed palea.

Plate 26. *Aristida longiramea* Presl. — a, Empty glume; b, flower, showing palea and inclosed stamens.

Plate 27. *Aristida nigrescens* Presl. — a, Spikelet; b, flower; c, palea.

Plate 28. *Podosaemum distichophyllum* Presl. Mexico. — a, Empty glumes; b, spikelet, empty glumes removed; c, dorsal view of flowering glume; d, anterior view of palea, showing stamens and lodicules.

Plate 29. 1, *Podosaemum tenuissimum* Presl. Panama, Mexico. — a, Empty glumes; b, floret; c, dorsal view of flowering glume; d, stamens and pistil. 2, *Pereilema crinitum* Presl. Panama. — a, Empty glumes; b,

dorsal view of flowering glume with a portion of the awn; c, palea; d, stamens.

Plate 30. 1, *Sporobolus ciliatus* Presl. Panama. — a, Spikelet; b, spikelet in fruit; c, pistil; d, fruit. 2, *Sporobolus humilis* Presl. Island of Luzone. — a, Entire spikelet; b, same, empty glumes removed; c, fruit. 3, *Sporobolus repens* Presl. Mexico. — Natural size.— a, Empty glumes; b, flowering glume and palea; c, pistil; d, anthers.

Plate 31. *Nowodworskya agrostoides* Presl. — a, Spikelet; b, back of flowering glume.

Plate 32. 1, 2, *Agrostis caespitosa* Presl. Peru (?). — a, Empty glumes; b, flowering glume; c, rudiment. — The lower figure is drawn from a specimen collected on the Wilkes Exploring Expedition in Peru. The upper figure is drawn from Presl's specimen. 3, *Agrostis rigescens* Presl. Peru (?). — a, Empty glumes; b, flowering glume and palea. — Habit drawings, natural size.

Plate 33. *Agrostis toluccensis* HBK. High mountains of Peru. — a, Empty glumes; b, spikelet with the empty glumes removed.

Plate 34. 1, *Trichodium album* Presl. Nootka Sound. — a, Empty glumes; b, floret. 2, 3, *Trichodium nanum* Presl. Peru (?). — Natural size. — a, Spikelet; b, floret. — The lower figure is drawn from a specimen of the same species collected on the Wilkes Exploring Expedition.

Plate 35. 1, *Deyeuxia densiflora* Presl. From mountains of Peru. — a, Empty glumes; b, floret, empty glumes removed, showing palea; c, rudiment. 2, *Deyeuxia ovata* Presl. High mountains of Peru. — a, Empty glumes; b, spikelet, empty glumes removed; c, rudiment.

Plate 36. *Deyeuxia fuscata* Presl. High mountains of Peru. — a, Empty glumes; b, spikelet, empty glumes removed; c, rudiment.

Plate 37. *Deschampsia calycina* Presl. — a, Empty glumes; b, spikelet, empty glumes removed; c, palea and grain.

Plate 38. *Avena pilosa* Presl. — a, Empty glumes; b, spikelet, empty glumes removed; c, floret; d, dorsal view of flowering glume; e, palea.

Plate 39. *Monopogon avenaceus* Presl. — a, Spikelet; b, back of first glume of one flower; c, back of second glume of one flower; d, third glume and inclosed palea; e, flowering glume, front; f, flowering glume, back; g, flowering glume, inside, flattened out; h, palea, back; i, ovary and lodicules.

Plate 40. 1, *Cynodon arcuatus* Presl. Island of Luzone. — a, Empty glumes; b, spikelet, empty glumes removed. 2, *Cynodon tener* Presl. Luzone. — a, Empty glumes; b, floret and rudiment.

Plate 41. *Chloris truncata* R. Br. — a, Empty glumes; b, spikelet, with the empty glumes removed; c, palea.

Plate 42. *Campulosus planifolius* Presl. Mexico. — a, Outer or empty glumes; b, spikelet, empty glumes removed, and floret expanded.

Plate 43. 1, *Diplachne brevifolia* Presl. High mountains of Peru, — a, Empty glumes; b, spikelet, empty glumes removed. 2, *Diplachne rigescens* Presl. — a, Emply glumes; b, spikelet, empty glumes removed.

Plate 44. 1, *Eragrostis alba* Presl. Monterey, Cal. Specimen in-

complete. — a, Empty glumes; b, spikelet, empty glumes removed. 2, *Eragrostis tenella* Beauv. — a, Spikelet; b, empty glume of the floret.

Plate 45. *Eragrostis lurida* Presl. Mountains of Peru. — a, Empty glumes; b, spikelet, empty glumes removed; c, dorsal view of flowering glumes; d, palea; e, grain.

Plate 46. *Eragrostis secundiflora* Presl. Mexico. — a, Spikelet; b, floret; c, inner view of the palea showing lodicules.

Plate 47. 1, *Eragrostis panamensis* Presl. Panama. — a, Spikelet; b, floret. 2, *Megastachya panicoides*. Presl. Mexico near Acapulco. — a, empty glumes; b, spikelet, empty glumes removed; c, floret.

Plate 48. 1, *Brizopyrum boreale* Presl. Nootka Sound. Specimen fragmentary. 2, *Brizopyrum pilosum* Presl. Acapulco. — a, Spikelet.

Plate 49. *Chascolytrum spicigerum* Presl. Mountains of Peru and Chili. — a, Entire spikelet; b, lateral view of flowering glume; c, palea; d, lodicules; e, pistil.

Plate 50. *Poa holciformis* Presl. — a, Empty glumes; b, spikelet, empty glumes removed; c, floret; d, palea; e, lodicules; f, pistil.

Plate 51. 1, *Poa nootkaensis* Presl. Nootka Sound (?), Mexico (?). — a, Empty glumes; b, spikelet, empty glumes removed. 2, *Poa secunda* Presl. Chilian Cordilleras. Fragmentary specimen. — a, Empty glumes; b, spikelet, empty glumes removed; c, dorsal view of flowering glume; d, palea; e, pistil and lodicules.

Plate 52. 1, *Bromus setifolius* Presl. In the Chilian Cordilleras. — a, Empty glumes; b, a single floret. 2, *Bromus secundus* Presl. Nootka Sound. — a, Empty glumes; b, florets.

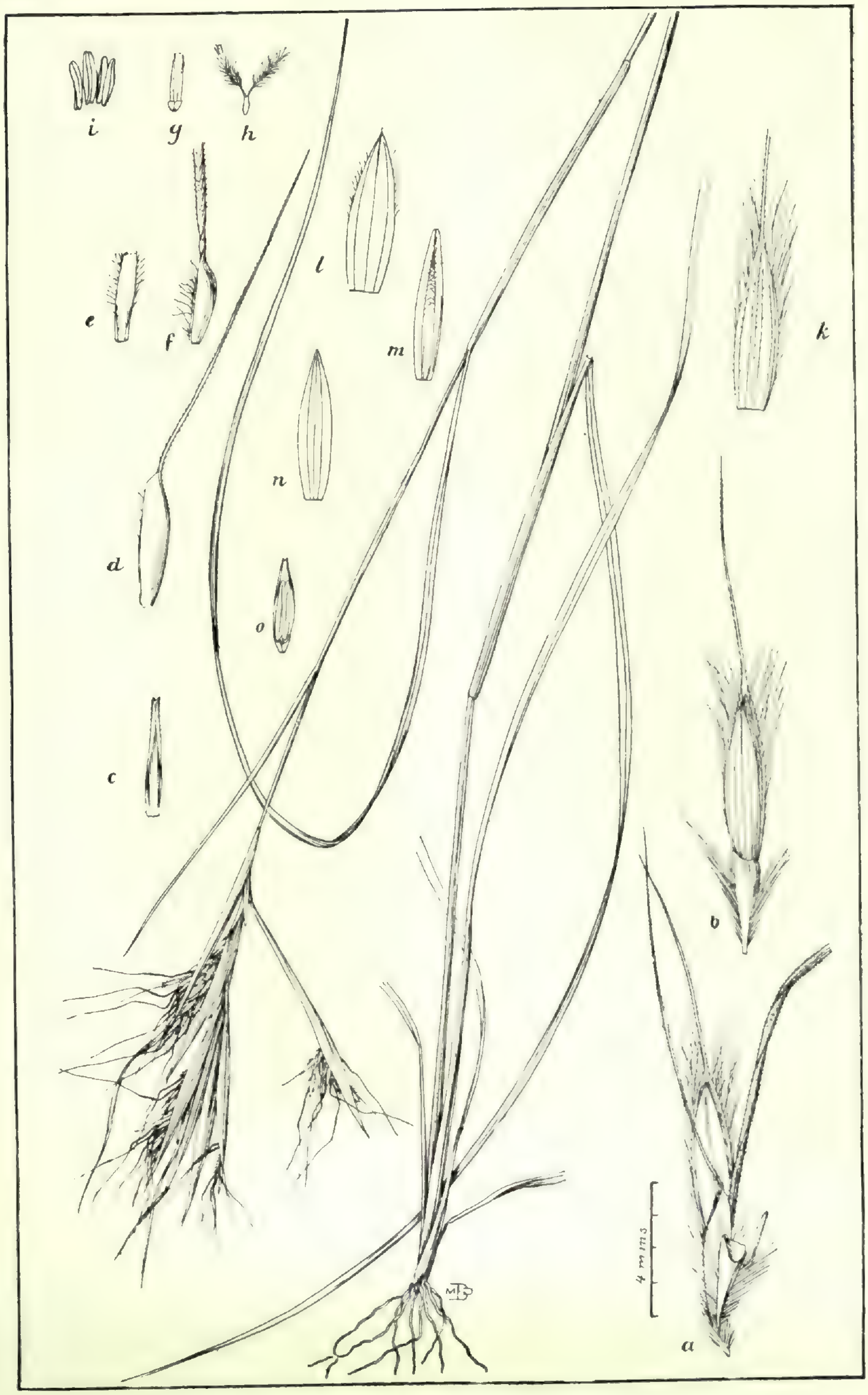
Plate 53. *Bromus virgatus* Presl. Mexico (?). Monterey, Cal. — a, Empty glumes; b, spikelet, empty glumes removed.

Plate 54. 1, *Ceratochloa haenkeana* Presl. Chilian Cordilleras, Mountains of Peru. — a, Lateral view of flowering glume. 2, *Hordeum comosum* Presl. Peru. — a, Interior view of group of spikelets, tip of awns removed.

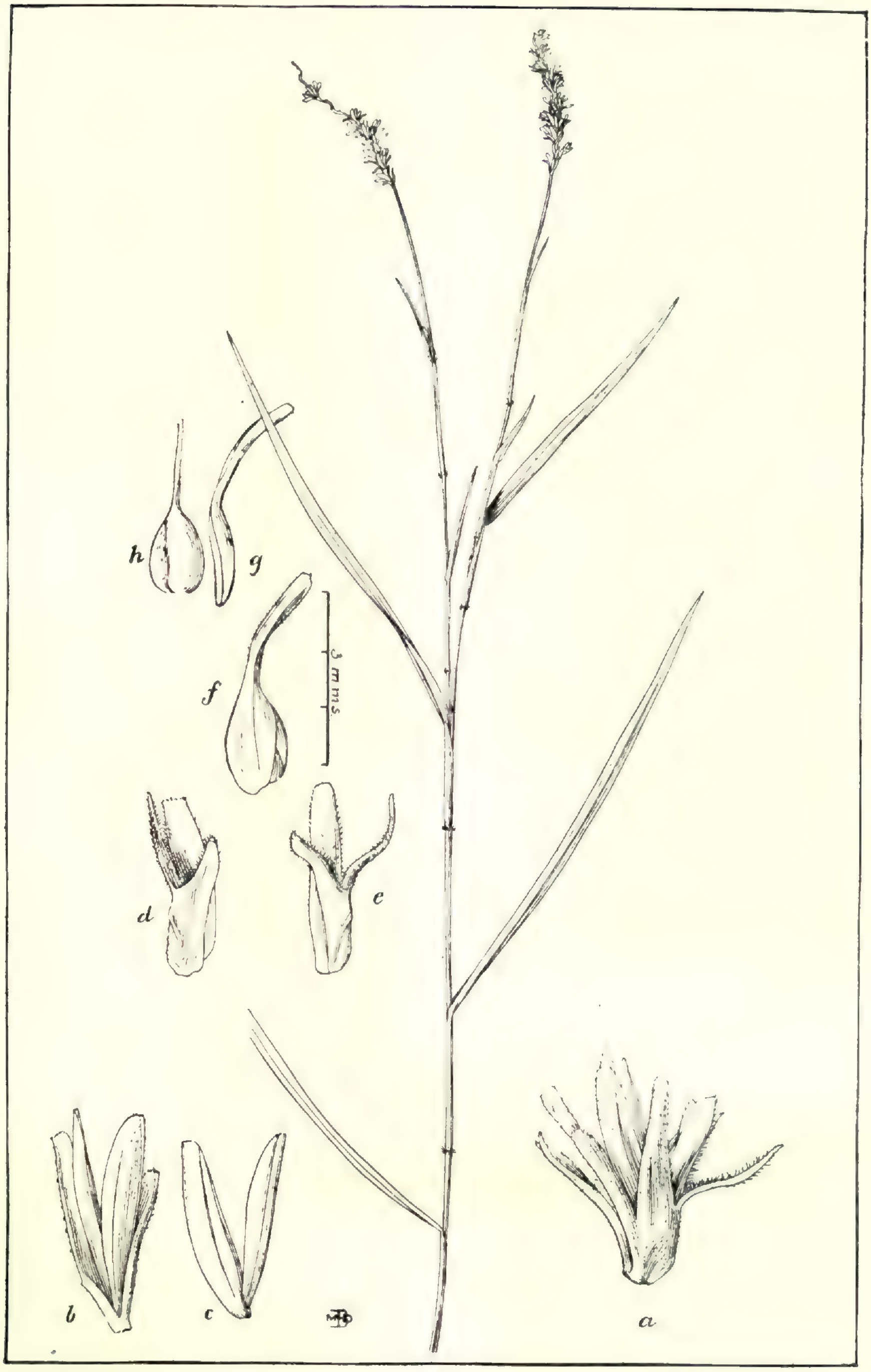
SACCHARUM SPICATUM, PRESL.

POGONOPSIS TENERA, PRESL (1). ANDROPOGON TENELLUS, PRESL (2).

ANDROPOGON MALACOSTACHYUS, PRESL.



DIECTOMIS ANGUSTATA, PRESL.

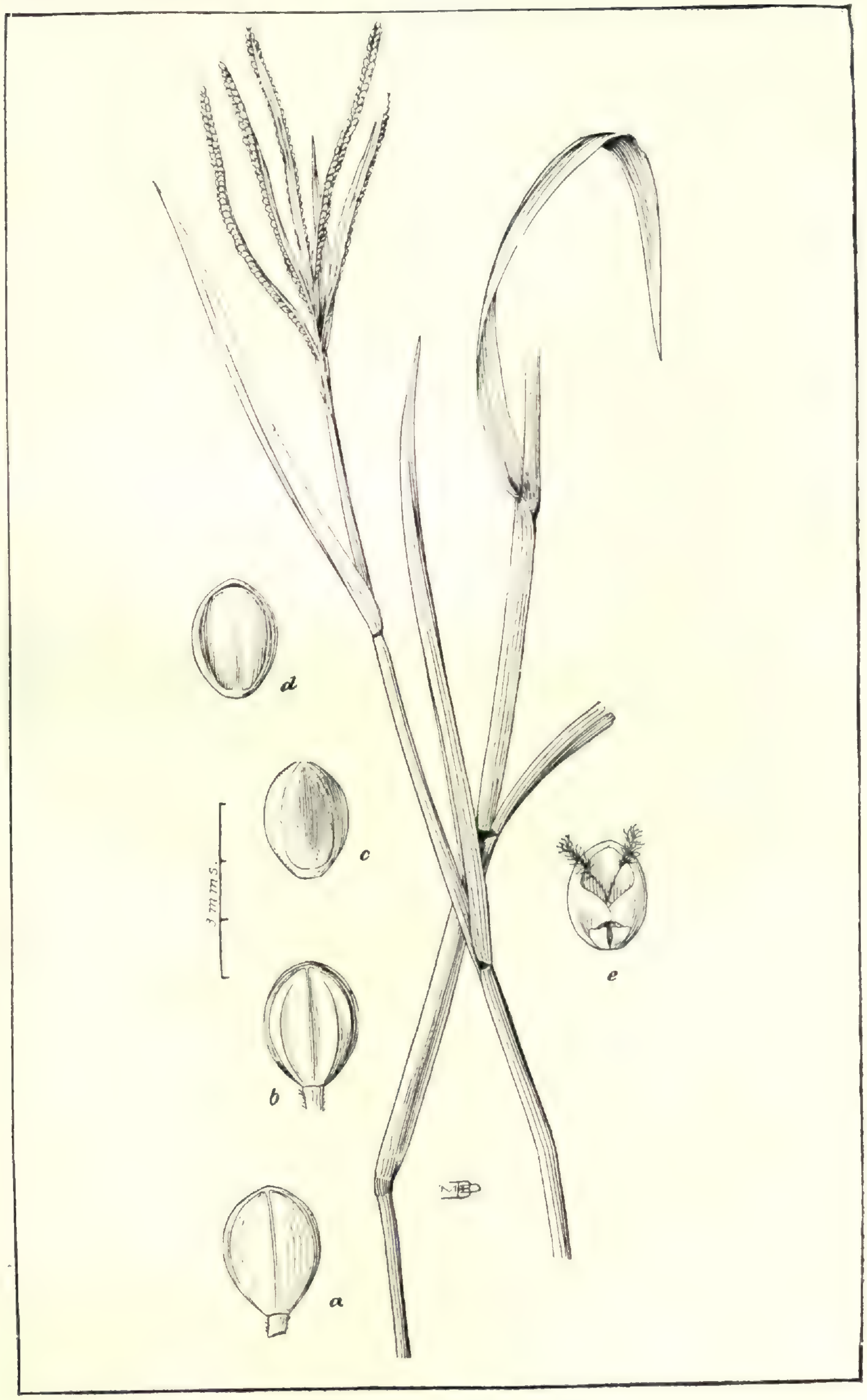


HEXARRHENA CENCHROIDES, PRESL.

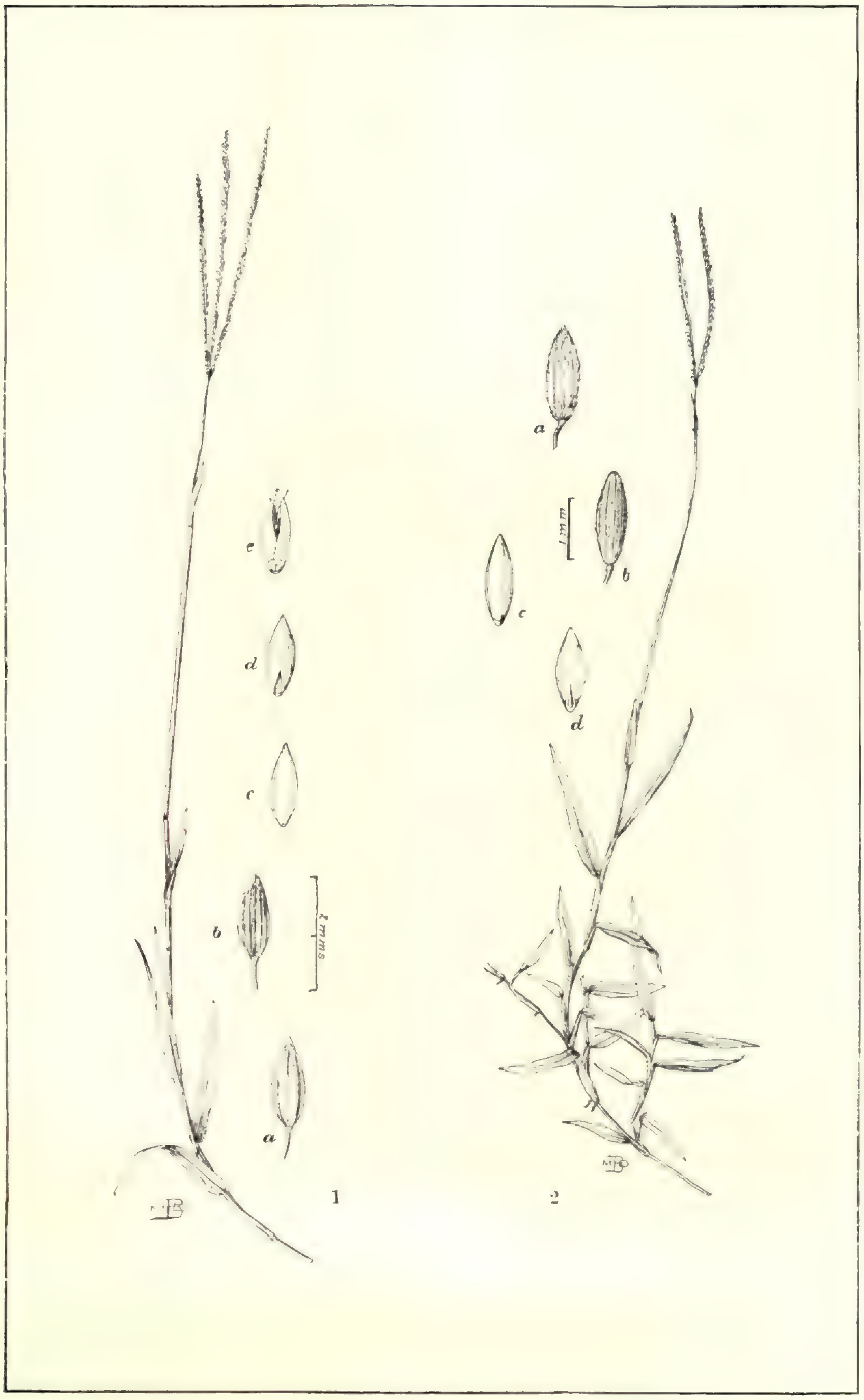
THYSANACHNE PERUVIANA, PRESL.

THYSANACHNE SCOPARIA, PRESL.

PASPALUM ATTENUATUM, PRESL.

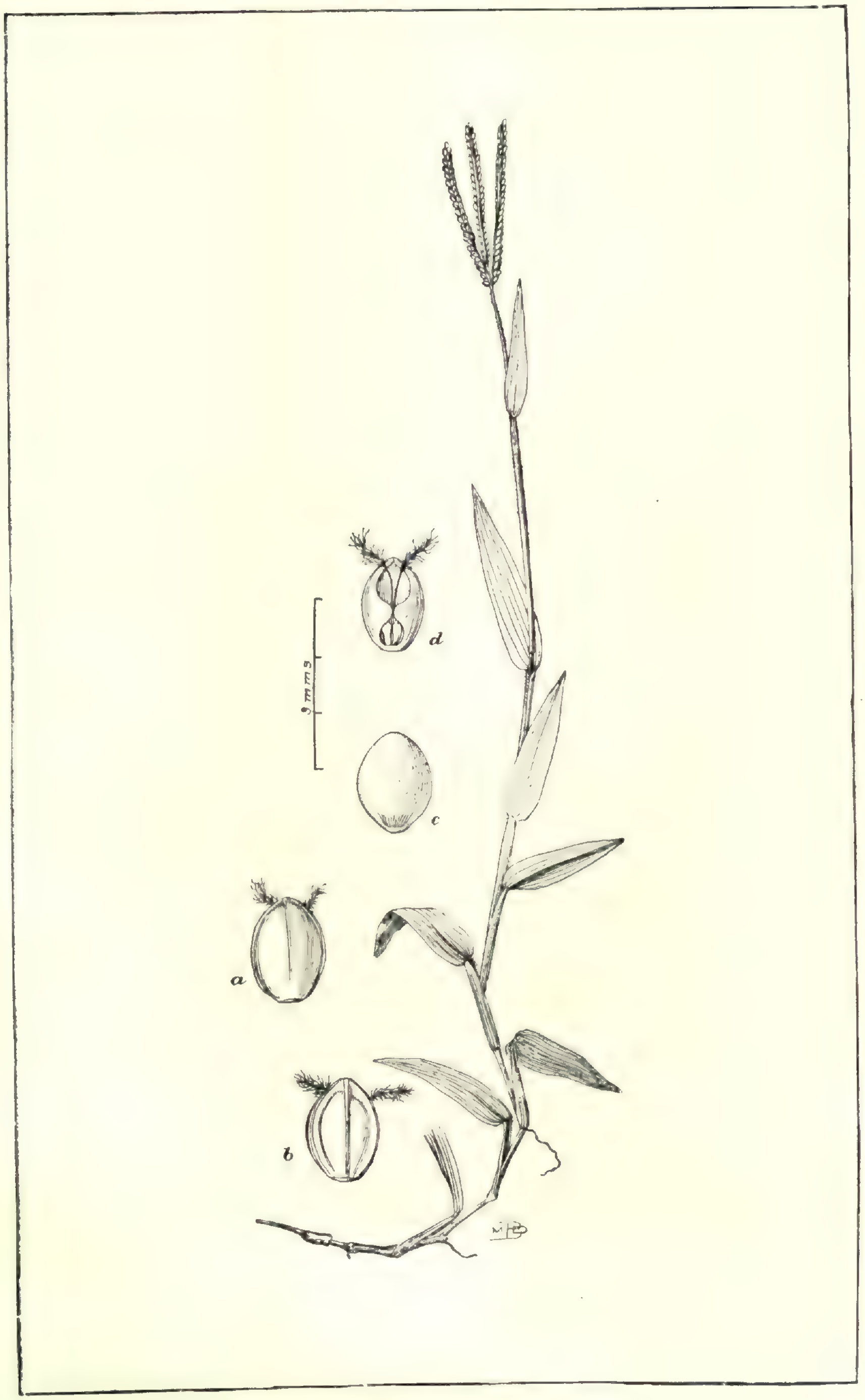


PASPALUM BRACTEATUM, Presl.



PASPALUM FUSCESCENS, PRESL (1). P. PUBESCENS, PRESL (2).

PASPALUM FUSCUM, PRESL.



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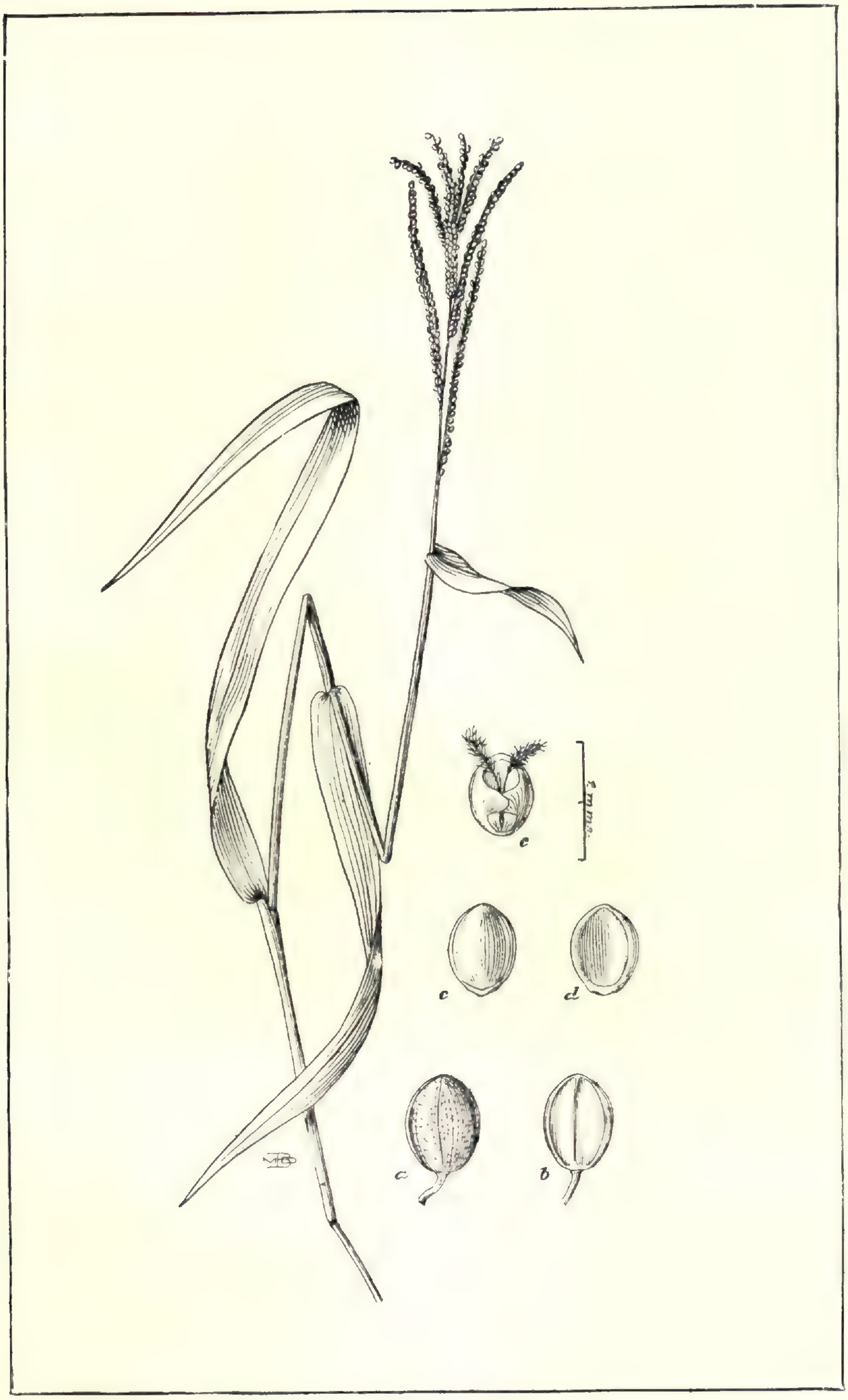
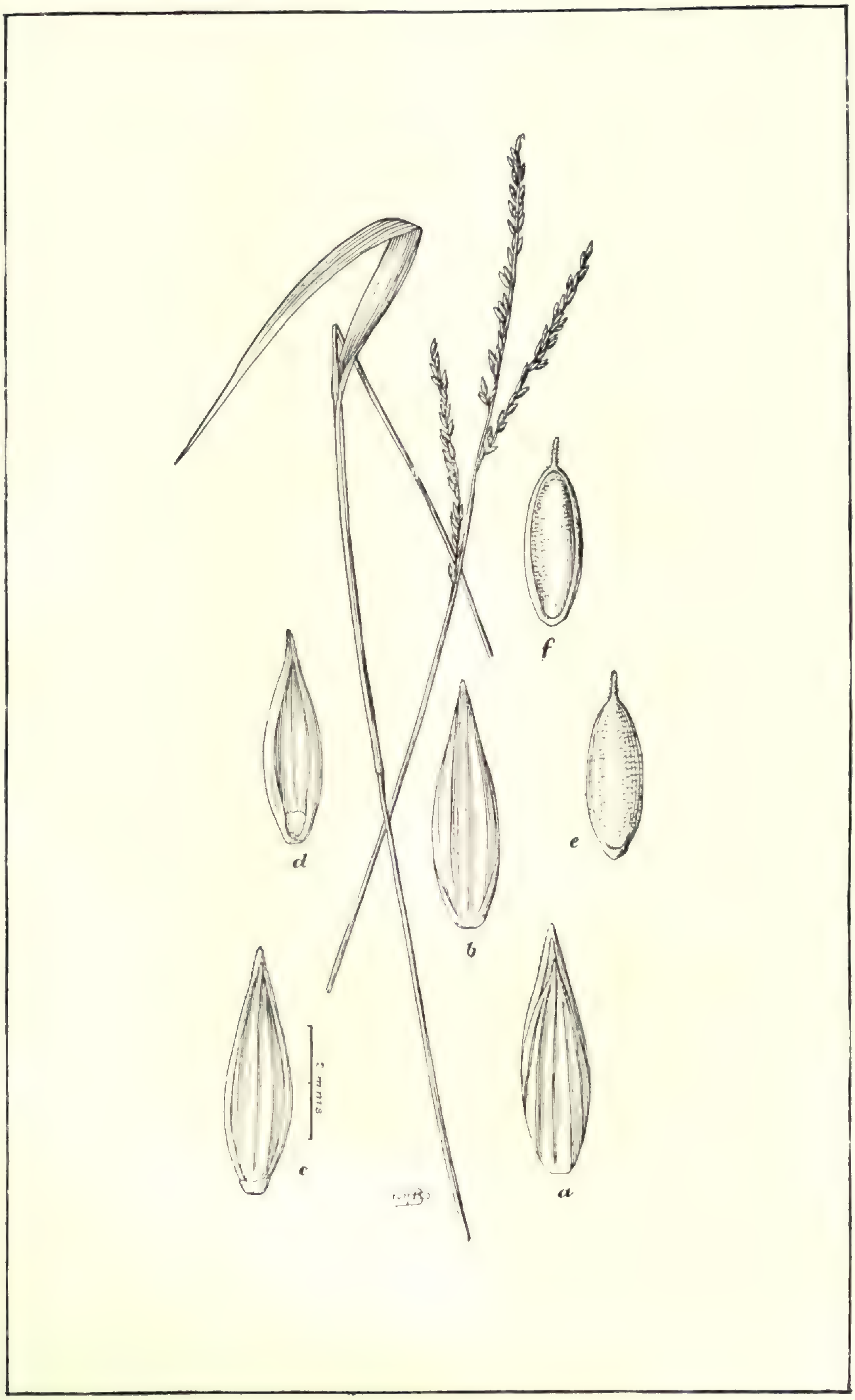
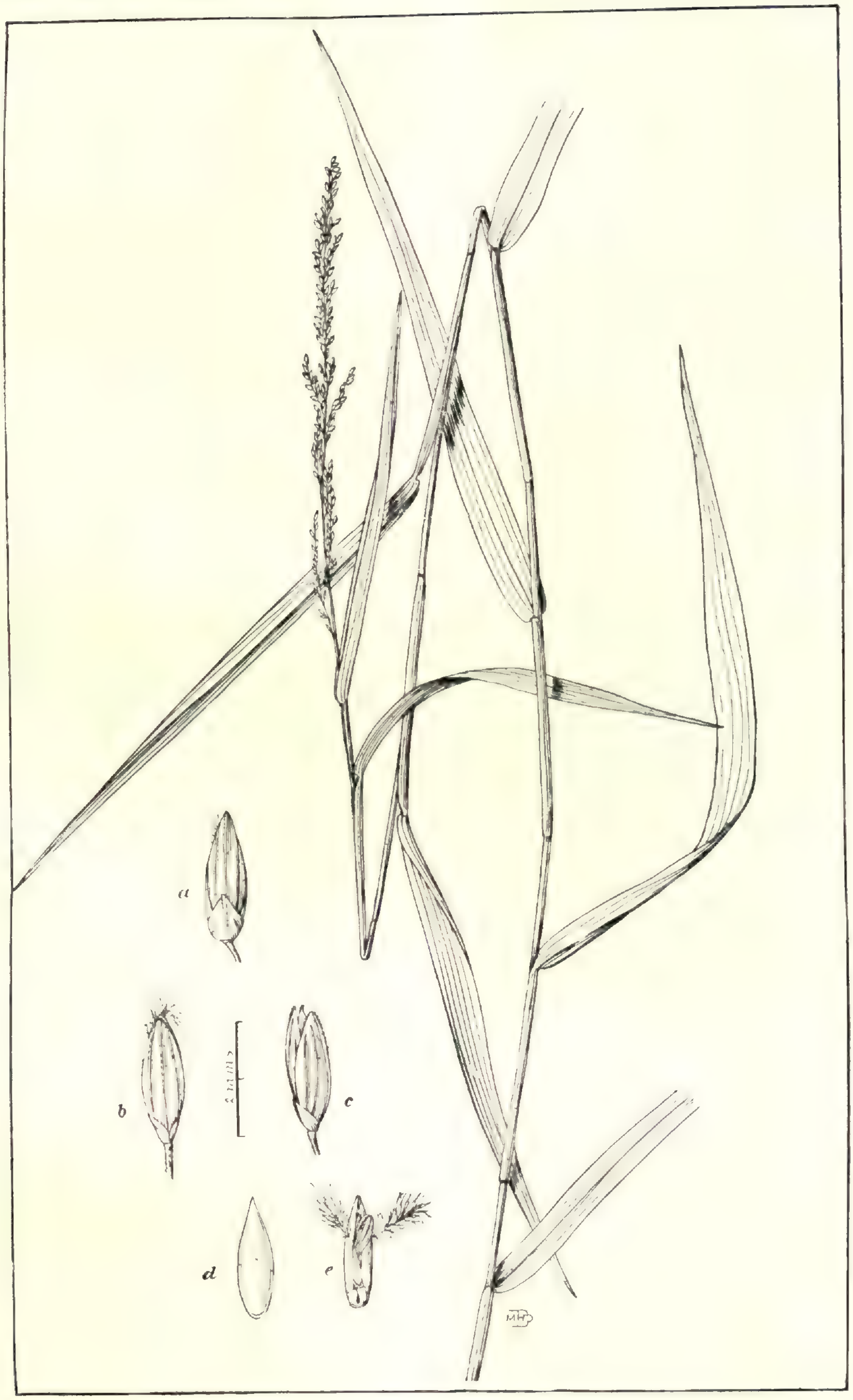


PASPALUM LENTIGINOSUM, Presl.

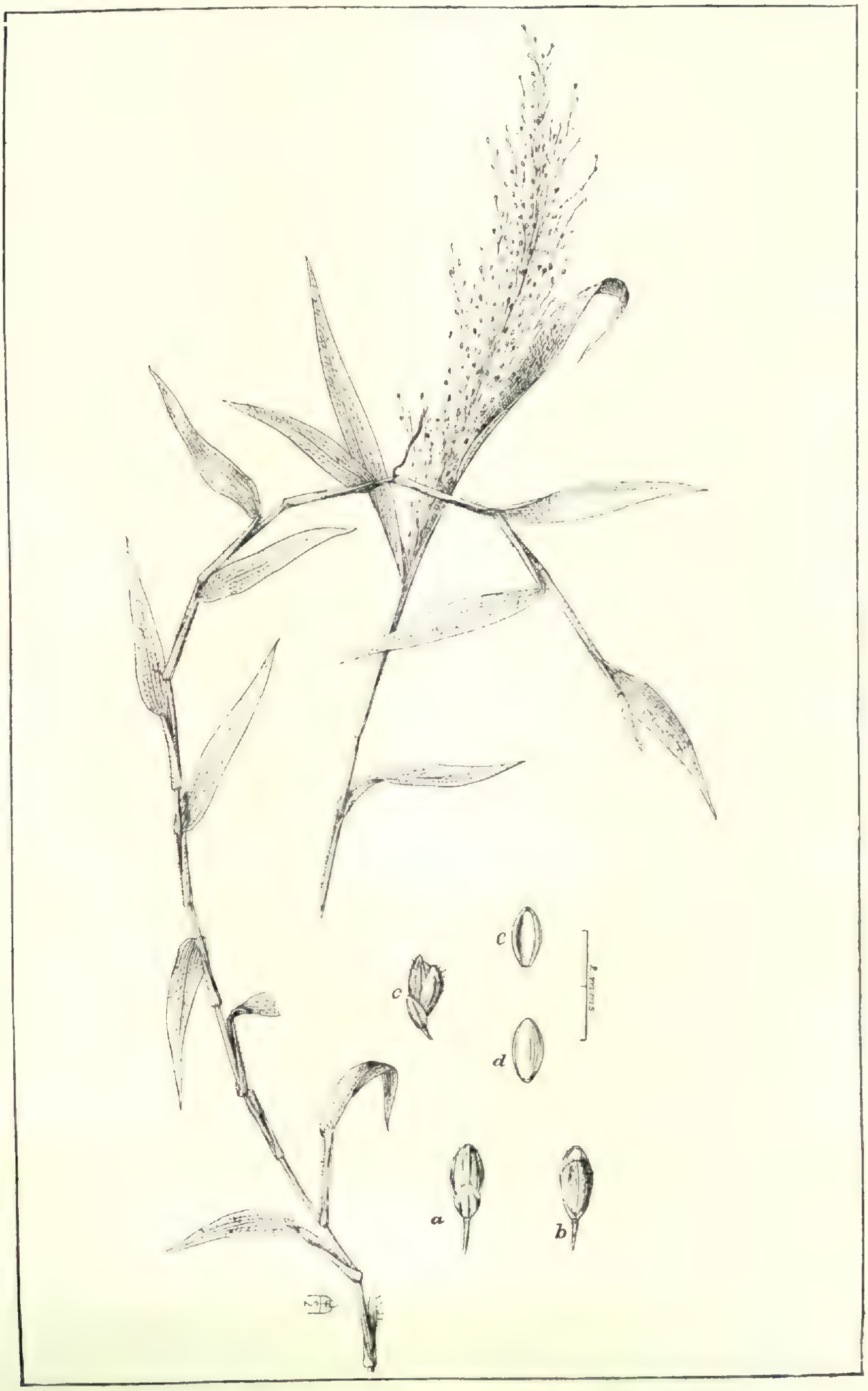


UROCHLOA PASPALOIDES, PRESL.



PANICUM AURITUM, PRESL.

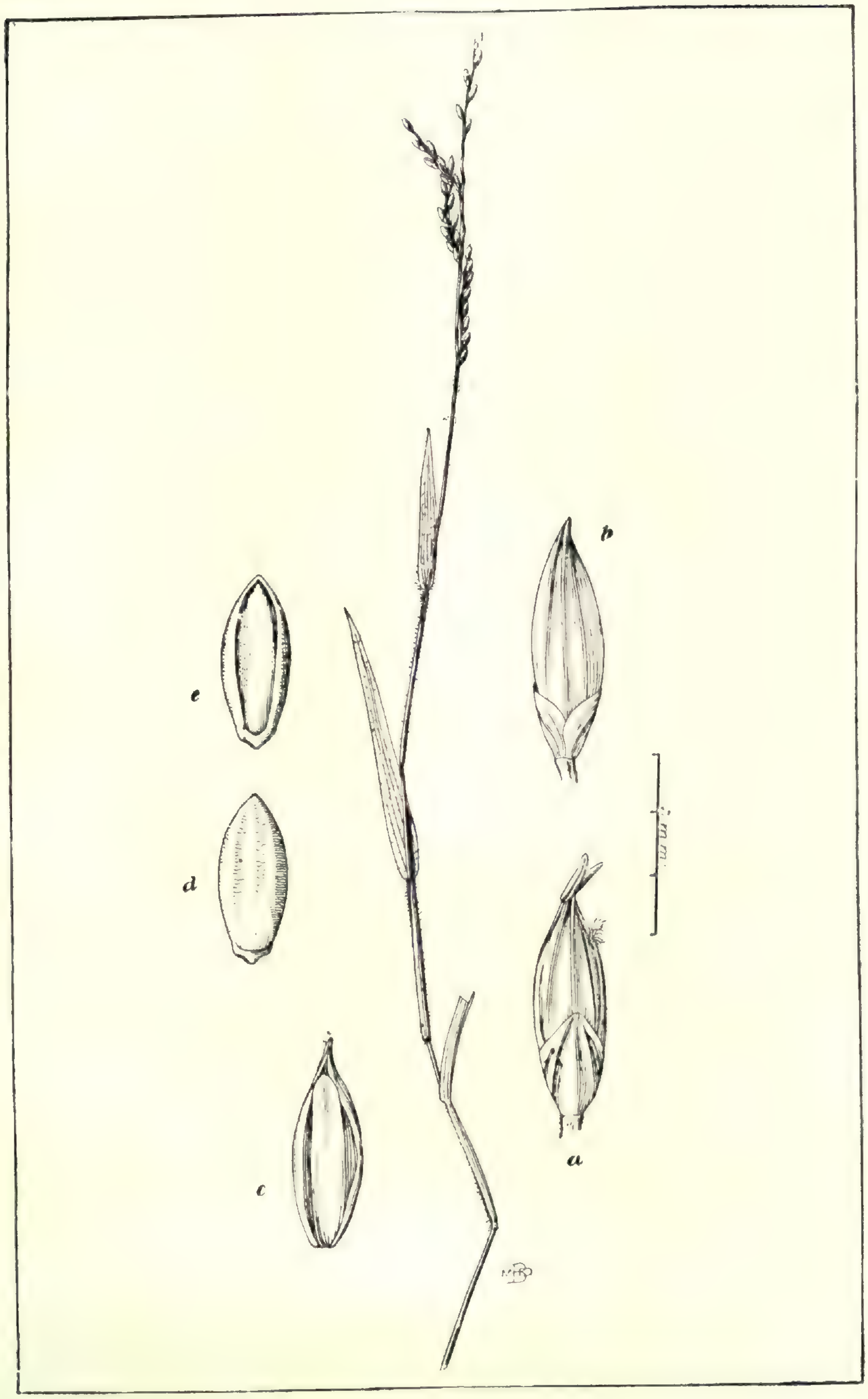
PANICUM BRIZAEFORME, PRESL.



PANICUM CARINATUM, PRESL.

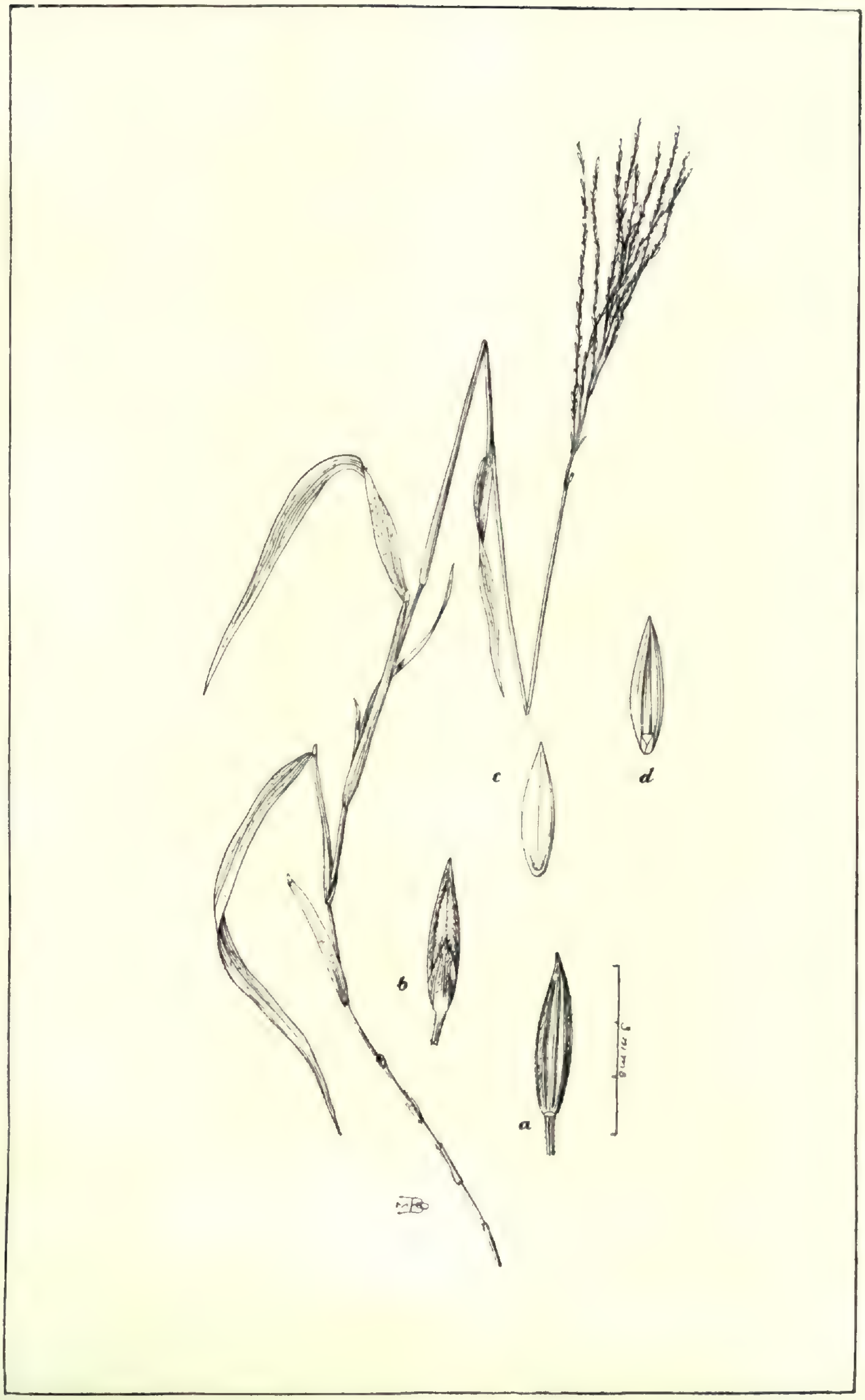
PANICUM FIMBRIATUM, PRESL.

PANICUM HIRTICAULUM, PRESL.

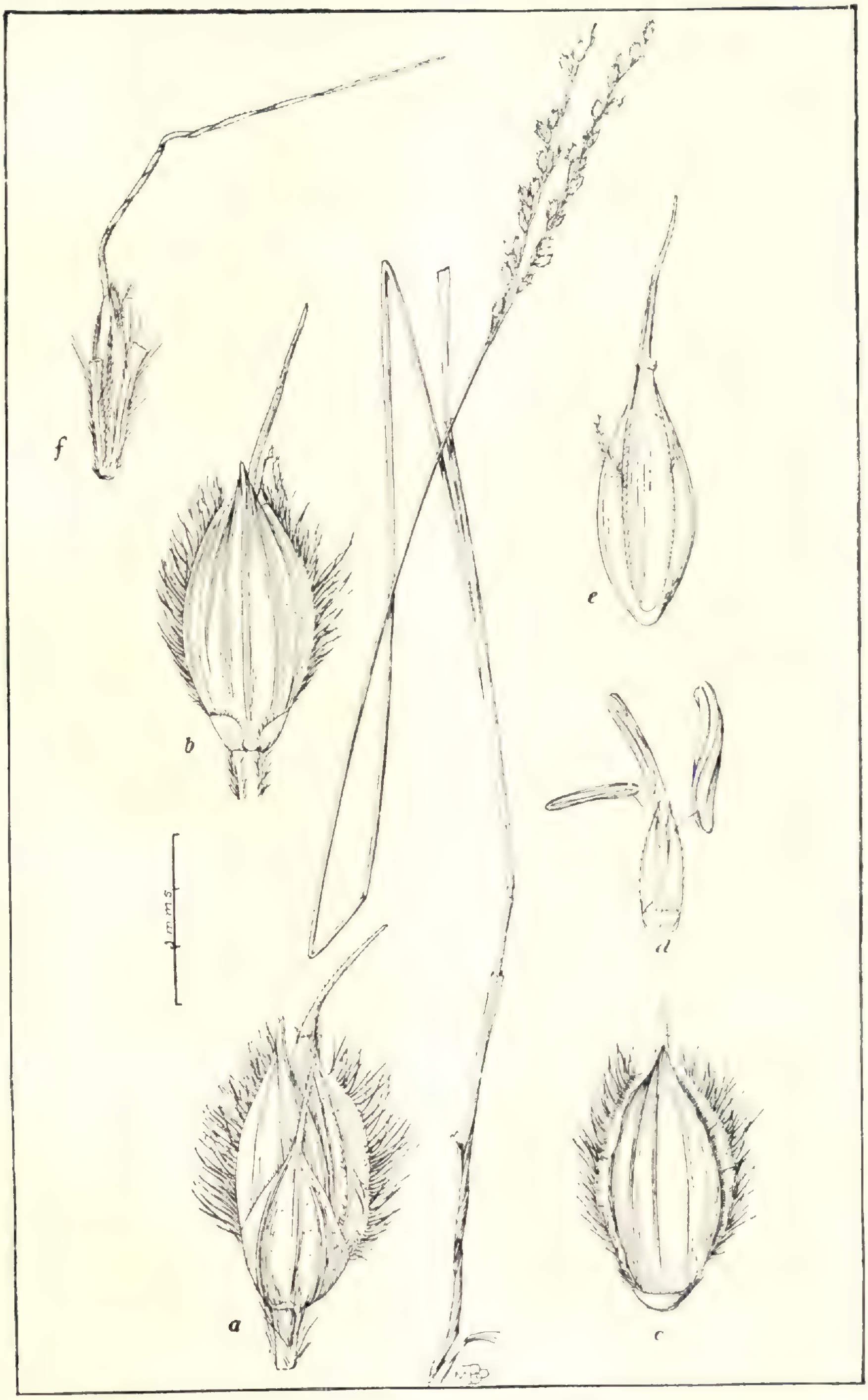


PANICUM MILIIFORME, PRESL.

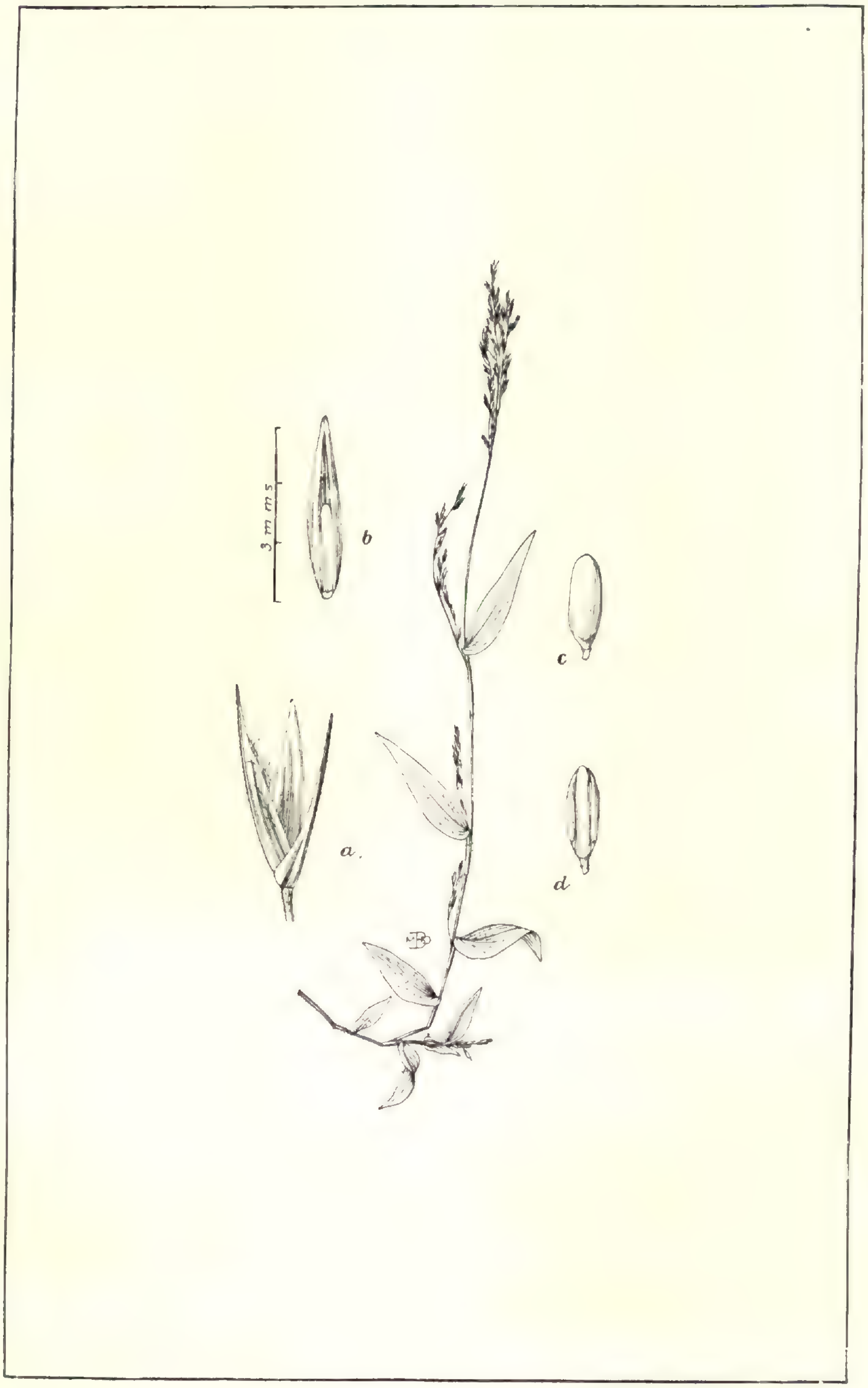
PANICUM PHILEIFORME, PRESL (1). P. POLYRRHIZUM, PRESL (2).



PANICUM STIPATUM, PRESL.



ALLOTEROPSIS DISTACHYA, PRESL.



OPLISMENUS TENUIS, PRESL.

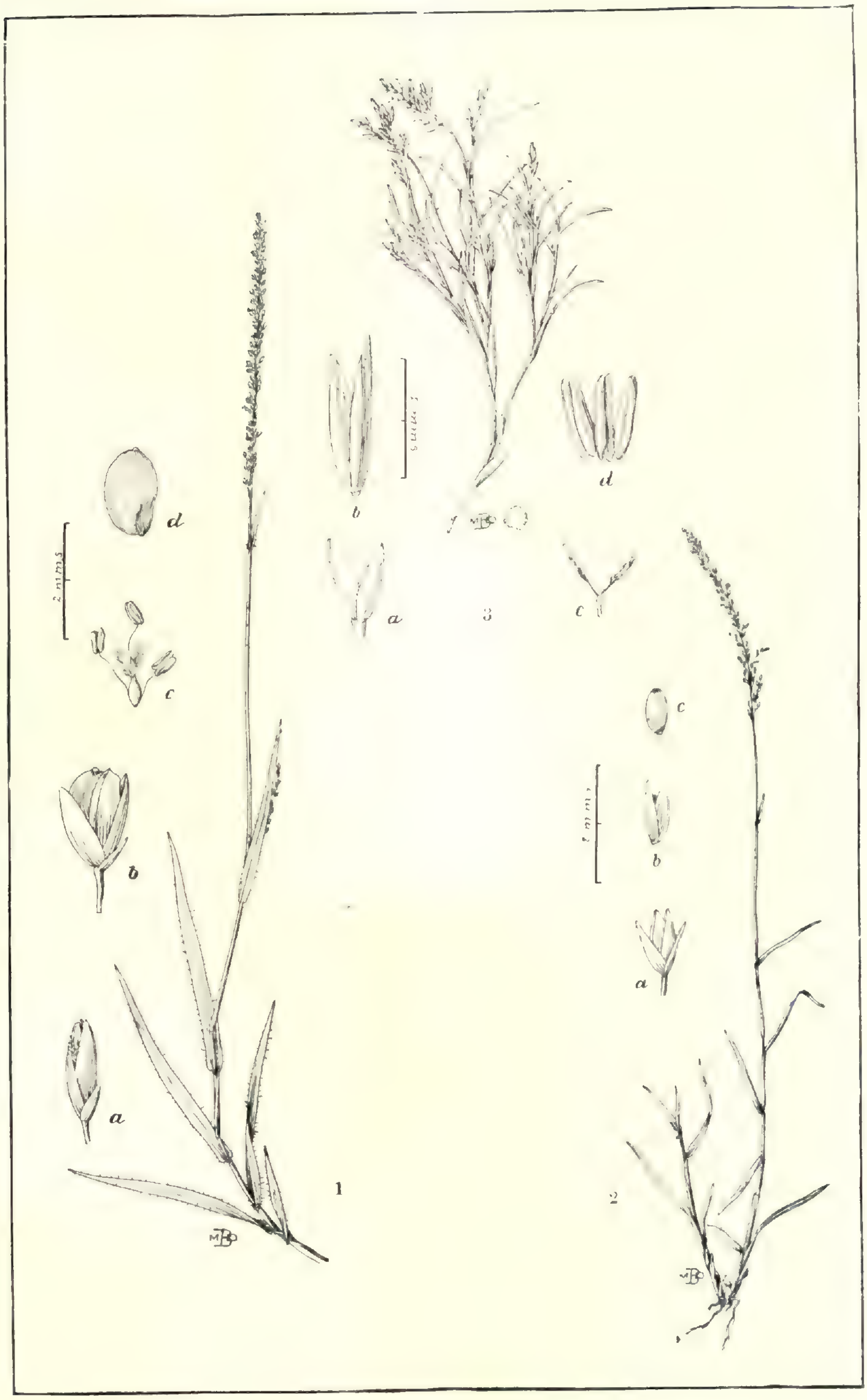
BERCHTOLDIA BROMOIDES, PRESL.

ARISTIDA LONGIRAMEA, PRESL.

ARISTIDA NIGRESCENS, PRESL.

PODOSAEMUM DISTICHOPHYLLUM, PRESL.

PODOSAEMUM TENUISSIMUM, PRESL (1). PEREILEMA CRINITUM, PRESL (2).



SPOROBOLUS CILIATUS, PRESL (1). S. HUMILIS, PRESL (2).
S. REPENS, PRESL (3).

NOWODWORSKYA AGROSTOIDES, PRESL.

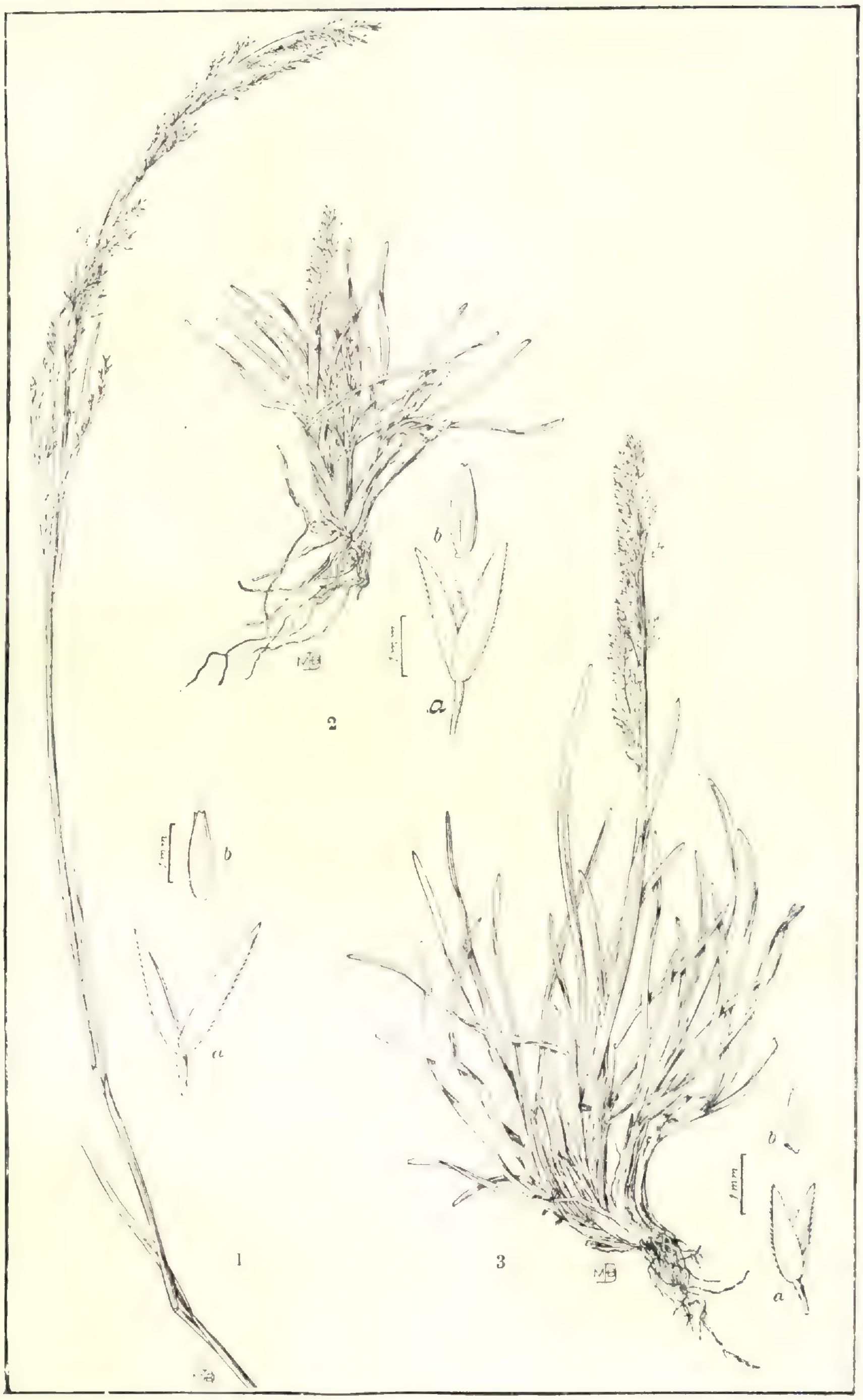
1

3

2

AGROSTIS CAESPITOSA, PRESL (1, 2). A. RIGESCENS, PRESL (3).

AGROSTIS TOLUCCENSIS, HBK.



TRICHODIUM ALBUM, PRESL (1). T. NANUM, PRESL (2, 3).

DEYEUXIA DENSIFLORA, PRESL (1) D. OVATA, PRESL (2).

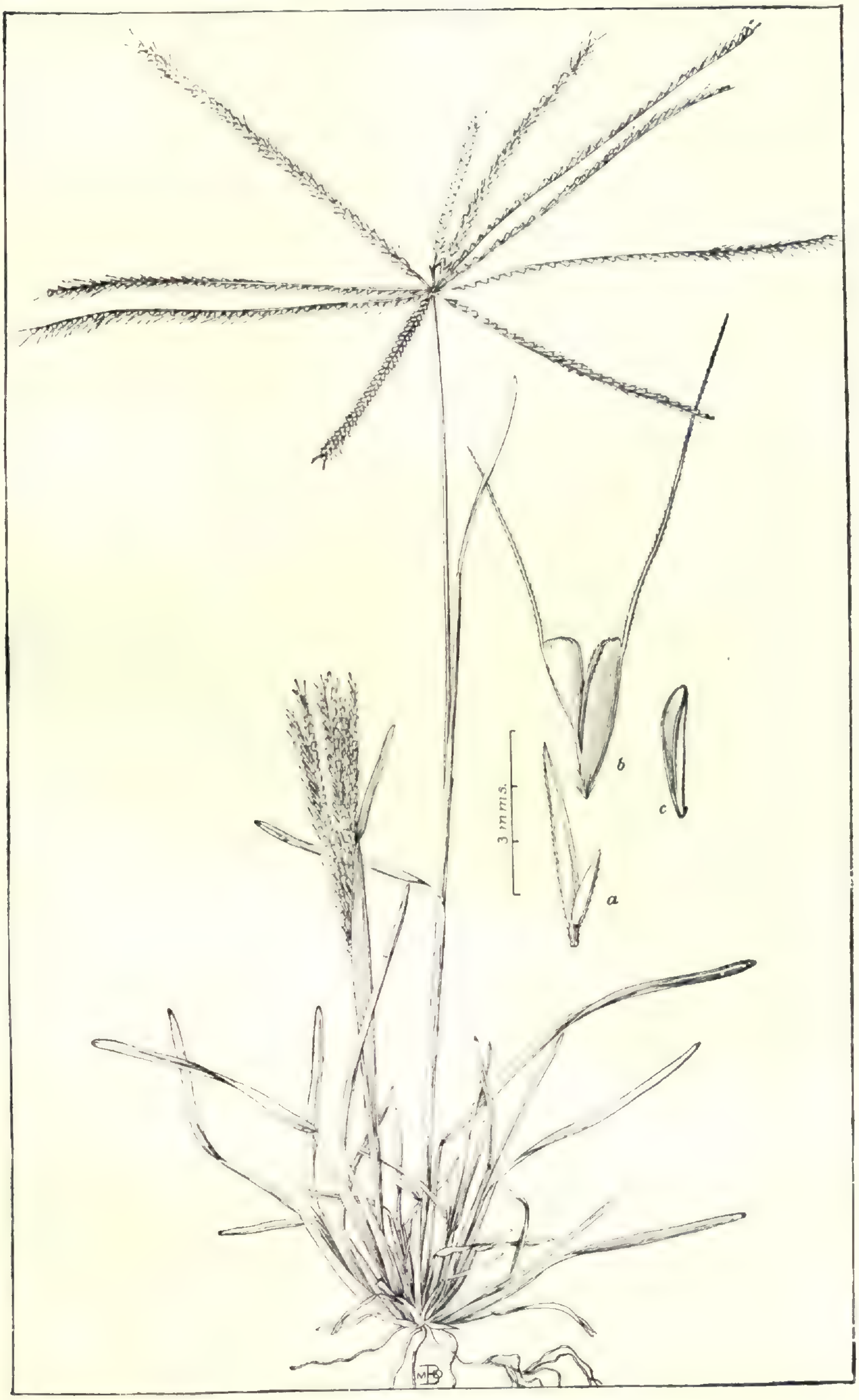
DEYEUXIA FUSCATA, PRESL.

DESCHAMPSIA CALYCINA, Presl.

AVENA PILOSA, PRESL.

MONOPOGON AVENACEUS, PRESL.

CYNODON ARCUATUS, PRESL (1). C. TENER, PRESL (2).



CHLORIS TRUNCATA, R. BR.

CAMPULOSUS PLANIFOLIUS, PRESL.

DIPLACHNE BREVIFOLIA, PRESL (1). D. RIGESCENS, PRESL (2).

ERAGROSTIS ALBA, PRESL (1). E. TENELLA, BEAUV. (2).

ERAGROSTIS LURIDA, PRESL.

ERAGROSTIS SECUNDIFLORA, PRESL.

ERAGROSTIS PANAMENSIS, PRESL (1). MEGASTACHYA PANICOIDES, PRESL (2).

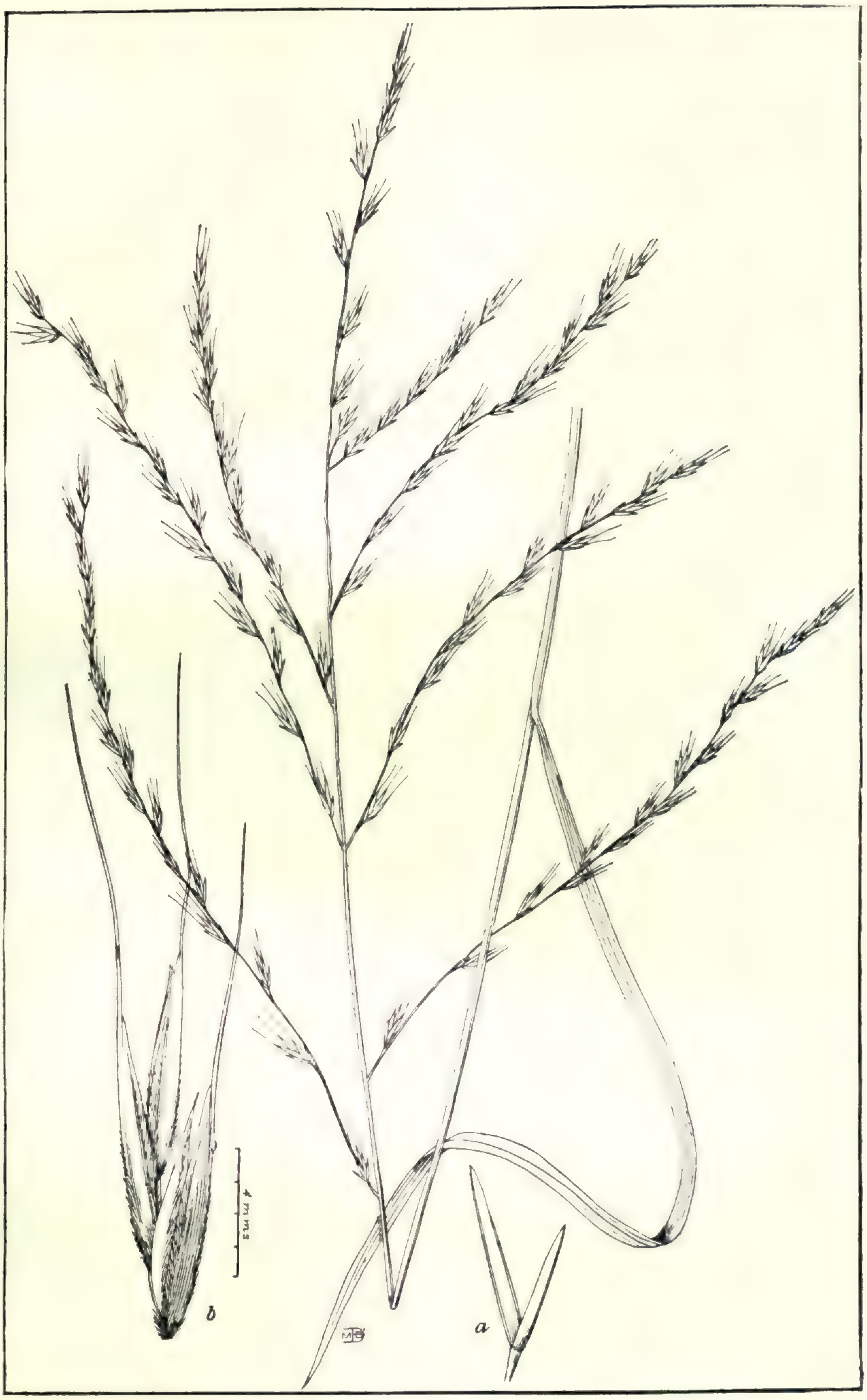
BRIZOPYRUM BOREALE, PRESL (1). B. PILOSUM, PRESL (2).

CHASCOLYTRUM SPICIGERUM, PRESL.

POA HOLCIFORMIS, PRESL.

POA NOOTKAENSIS, PRESL (1). P. SECUNDA PRESL (2).

BROMUS SETIFOLIUS, PRESL (1). B. SECUNDUS, PRESL (2).



BROMUS VIRGATUS, PRESL.

CERATOCHLOA HAENKEANA, PRESL (1). HORDEUM COMOSUM, PRESL (2).

A SCLEROTIOID DISEASE OF BEECH ROOTS.

BY HERMANN VON SCHRENK.

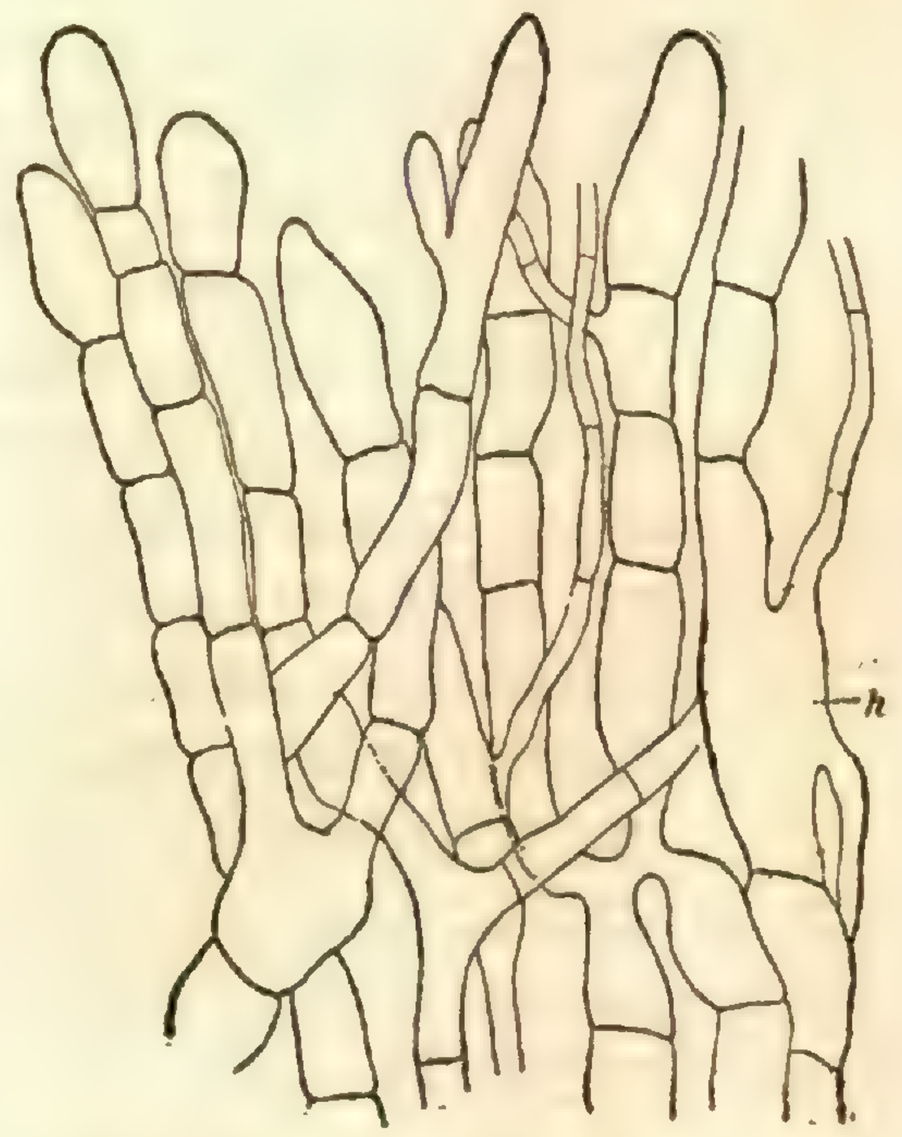
In the examination of some beech humus at Grand View, Rockland Co., N. Y., during the past summer, a large number of small tubercles were found attached to the fibrous roots of the beech trees. These trees grew in a clump, thirty or forty together, in a creek bottom in a rich humus soil, strongly admixed with clay. Cattle had cropped the ground closely, and had here and there wounded the larger surface roots. From such points numerous shoots had grown. A number of these were carefully dug up, to verify the connection of the tubercles with the beech roots. No tubercles were found on any beeches away from the clump mentioned. Masses of earth with roots and tubercles were collected and washed out, and the smaller roots with the attached tubercles were hardened in alcohol.

The tubercles were of various shapes and sizes, some almost round, others more elliptical or heart-shaped, and varying in size from those about as large as a small pea to some barely visible to the naked eye. Many occurred close together, oftentimes several on a small root (Pl. 55, fig. 1). Here and there one tubercle has the appearance of being composed of two or more parts (Fig. 1 'a', Fig. 2). From each body colorless strands extended through the ground, which join or pass from the tubercle at no definite point (Pl. 55, fig. 1 'b', fig. 2. Pl. 56, fig. 3 'b'). The tubercles are grayish-white in color.

With these bodies, others, very similar to these, are found. These are more regular in form, of a finer texture, and yellowish in color. On examination they proved to be small sclerotia, such as one frequently finds in humus soils.

They probably belong to some one of the Agaricinae. The sclerotia had no very definite outer layer, and were uniformly composed of very fine hyphae, loosely interwoven. Toward the periphery these became more or less parallel, and at certain points passed off in the form of long strands, resembling those passing off from the tubercles. Nowhere was any direct connection established between the two masses.

On examining the gray tubercles more in detail, they are found to consist of a bundle of cylindrical bodies, much intertwined, evidently roots, which are covered and firmly held in place by a membrane or sheath. The latter is composed of fungus hyphae, arranged in two distinct layers, easily to be torn one from the other. The sheath as a whole is but loosely connected with the bundle of roots, as very slight teasing with a needle will enable one to pull off the whole intact. With this sheath the strands of hyphae already mentioned are pulled off. Of the two layers, the outer is the thicker one. It is formed of hyphae parallel to each other, or nearly so, of a very large diameter and many-septate. The individual cells are about twice as long as they are broad, and in all cases are empty. The hyphae branch freely, and anastomose frequently with neighboring hyphae. One cell may have several branches (at 'h') either of the same diameter or smaller, one



HYPHAE FROM OUTER LAYER OF SHEATH (×520).

branch extending forward, the other back. H-connections are frequent, and once a distinct clamp cell was found. Because of this frequent branching and anastomosing, the whole layer is firmly united, and forms a mat, which no teasing can separate into its component threads. In section this layer appears like a layer of pseudoparenchyma (Pl. 55, fig. 8 ‘ p ’. Pl. 56, fig. 2 ‘ p ’), varying in thickness at different points on the tubercle. Wherever any depression on the latter occurs, the hyphae of this layer immediately fill it, so that in many places it is several millimeters in thickness. The inner layer (Pl. 55, fig. 8 ‘ s ’) is formed of very fine hyphae, so closely interwoven that it was not possible to separate the individual threads. The hyphae of this layer are easily torn, so that in pulling off the sheath, they readily separate from the main mass of hyphae and rootlets. The latter are firmly held in place by the hyphae (Pl. 56, fig. 2 ‘ o ’); which completely surround each root, and fill all spaces between them. Often, open spaces occur between the roots, crossed by strands of mycelium, looking as if the roots had spread apart, and had not yet given the fungus an opportunity to fill the space. Around a number of root tips two layers of fine hyphae are very evident (Pl. 55, fig. 10 ‘ h ’. Pl. 56, figs. 1 and 2‘ h ’). The layer which is next the tip, is much denser than the following one, and consequently darker.

Coming now to the main body of the tubercle, it is found to consist of a large number of small rootlets, much twisted and contorted, which, when the sheath is removed, present an appearance much like a mass of intestines (Pl. 56, fig. 3). They are firmly pressed one against the other, and are held in place by the fine hyphae. If they are torn apart and straightened out as far as possible, it is seen that these roots are branches and branchlets of a larger root, and apparently have all originated from a single root. A small piece of the large mass is represented, much flattened, on Pl. 55, fig. 10. Each branch is much bent from side to

side, and looks as if some obstacle had been put in its path, and as if by a series of nutations it had endeavored to get away from the obstruction. At short intervals new branches appear, up to within a few millimeters of the root-tip. The branching is irregular, but the majority of the branchlets have a direction parallel to each other so that a longitudinal and transverse axis of each tubercle can be distinguished. If a longitudinal section be made through a tubercle some rootlets are cut transversely, but the majority in part radially and in part tangentially parallel to the longer axis. A complete radial section is impossible because of the contorted form of the roots. A section reconstructed from a large number of sections is represented on Pl. 56, fig. 1. It is to be noted that all roots keep on growing, even after giving off branches, so that on one transverse plane there are but few young roots (Pl. 55, fig. 10). A transverse section shows most of the roots cut across (Pl. 56, fig. 2). Between the roots the fine filling of fungus hyphae is seen, and about one, a darker ring ('h') indicating that this section has been made near the tip of the rootlet.

The structure of each root is peculiar. On the outside is an epidermal layer composed of elongated cells, looking much like palisade cells. These give one the impression that the root may have endeavored to get rid of the appressing fungus by increasing in diameter. Nowhere do any fungus threads enter this layer of cells. The hyphae lie closely appressed, and seem to adhere to the cell wall, but I never saw any of them penetrate it. Inside this epidermal layer come two layers of the cortex, the endodermis and two radial bundles (Pl. 55, fig. 8). There are no intercellular spaces, and the cell walls everywhere are very thin. The root tip is much simplified. The root cap consists of but two layers of flat cells (Pl. 55, fig. 9 'c') resembling in this respect the root cap of the mycorhiza. The large columnar epidermal cells originate close

to the tip ('e'). The meristem cells are very large, compared with those found in the roots of the mycorhiza.

In tracing the development of these tubercles the structure of the beech roots as they are found normally must be remembered. Since the researches of Frank * it is generally recognized that the roots of the beech when grown in humus soil, are surrounded at their tips by a mantle of fungus threads, which grow in more or less intimate contact with the root itself, and, according to Frank, sustain a sort of symbiotic relationship, known collectively as the mycorhiza. But few of the fungi to which these hyphae are supposed to belong are known as yet, but wherever beeches occur in humus soils, some fungus is found associated with their roots.

This is true of our American beech, *Fagus ferruginea*, of which roots from different localities have been frequently examined. The roots of the mycorhiza are as a rule coralloid in form, i. e. short, frequently branching, grayish-white in color, but never, so far as I have seen them, contorted or hypertrophied in any way.

The trees at Grand View had no fungus mantle on the ultimate root tips of the larger roots on which tubercles were found. All rootlets free from the tubercles were short, with a blackened epidermis. All stages from such short uncovered roots to the full-sized tubercle were seen, and the method of growth appears to be as follows. The strands of some humus inhabiting fungus happen to grow over one of the ultimate branches of the beech root. For some reason the hyphae of that strand then develop profusely at the point of contact and gradually grow around the root. The beginning and end of the strand are soon

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* Frank, B. Über die auf Wurzelsymbiose beruhende Ernährung gewisser Bäume durch unterirdische Pilze. (Ber. d. deutsch. bot. Gesell. 3 : 128. 1885.) — Über die physiologische Bedeutung der Mycorhiza. (Ber. d. deutsch. bot. Gesell. 6 : 248. 1888.)

not to be distinguished (Pl. 55, fig. 7) as its hyphae pass imperceptibly over into those of the forming sheath. It ought to be said that hyphae of large as well as those of small diameter are found in the strands passing about the beech roots. The sheath grows rapidly along the rootlet, until it reaches the point where that root joins a larger one. If another small root happens to be close by, the hyphae may grow over that one in similar manner, as evidently they did in several instances (Pl. 55, figs. 1 and 2). Shortly after being thus enveloped the rootlet begins to grow vigorously, at least it tries to. Lateral rootlets begin to appear close to the tip (Pl. 55, figs. 4 and 7 'b'), and they are pressed against the parent root by the enveloping sheath. In their endeavor to grow out, the roots execute circumnutating movements and gradually acquire the much contorted appearance already described. A number of stages in the process are shown in figs. 4, 5 and 6. Here the sheaths have been removed for clearness, and the branches have been pulled apart. Originally they were closely appressed. After some time the large skein is complete, and it is impossible to say how long the process would have continued. As each tubercle grew in size the enveloping hyphae kept pace with the growing roots. Sometimes two tubercles would touch, and then the hyphae of the two sheaths would fuse and thus bring about the appearance of a compound tubercle (Pl. 55, fig. 2).

It now remains to inquire what the cause and meaning of the formation of these structures may be. The beech roots are as a rule covered by a fungus mycelium, which surrounds them and of which many hyphae enter the epidermal cells. All observers, Frank,* Schlicht,† Sarauw,‡

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* Frank, B. *l. c.*

† Schlicht, Alb. Über neue Fälle von Symbiose der Pflanzenwurzeln mit Pilzen. (Ber. d. deutsch. bot. Gesell. **6**: 269. 1888.)

‡ Sarauw, G. F. L. Rodsymbiose og Mykorhizer saerlig hos Skovtraeerne. (Bot. Tidsskrift **18**: 127. 1893.)

Möbius,* and others agree that the only effect which the fungus has on the root is to stunt it, and as if to counterbalance this, it causes it to branch more frequently than it otherwise would. A multi-branched coralloid form of root is thus brought about. This has been one of the reasons for considering the relation of fungus and root a symbiotic one, for in cases of parasitism some form of hypertrophy, starch accumulation, or other evidence of stimulus is met with.† In the tubercles described there is evidently some form of stimulus which brings about the proliferation of roots, and that stimulus is probably exerted by the fungus mycelium. To that extent the phenomenon would lead one to class the structures among such as are formed because of the action of some parasitic fungus. But there is here no evidence of parasitism, no starch accumulation, and what is more, no evident connection between the fungus and the root. The hyphae simply surround the roots without entering the cells. Because of the greatly increased and abnormal growth of the roots, which cannot be without effect on their physiological activity, much less of benefit to them, one must class the tubercles as pathological conditions of these roots. The presence of a large number of small sclerotia together with the tubercles suggests that the sterile mycelium of the tubercles probably belongs to some Hymenomycete which usually forms sclerotia. Some of these hyphae come into contact with the beech roots, stimulate them, and then, in their further growth, adhere to the sclerotium-forming tendency and thus bring about the tubercles described. Their nearly constant form and size, as well as the similarity of the loose hyphal network with that of the small sclerotia all point in that direction.

The formation of numerous twisted roots with short

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* Möbius, M. Der Erdboden in Beziehung zur Ernährung der Pflanzen. (Gartenwelt **3**: 154. *fig. 1.* 1898.)

† Frank, B. Ber. d. deutsch. bot. Gesell. **3**: 258. 1885.

branches is without doubt due to a stimulus exerted by the fungus. The only causes which could bring about advancement toward the root tips of lateral root-formation are two, pressure at the tip, and injury to the same, both equally effective in preventing onward growth of the root.* The experiments of Pfeffer and of Newcombe showed that growth had to cease entirely before the lateral roots make their appearance. Experiments of my own led to similar conclusions. Seedling beans, peas, cotton, squash, castor beans were grown in plaster, both completely hard, and softened plaster kept in moist chambers, solutions of gelatin, in rubber bags, etc. The results are to be recorded elsewhere. All the experiments showed conclusively that only when there was an absolute cessation of growth, did the lateral roots appear. The pressure must be a great one, which prevents onward growth, and it is scarcely conceivable that the pressure exerted by an envelope of fungus hyphae would be sufficiently great to do this. But aside from this the pressure, if such existed, did not stop the growth, for as has been said, the roots all kept on growing, even after being covered by the fungus sheath. It would then appear that the only other cause except that of stimulus, which would bring about lateral root development, could not have been effective in this case.

It is impossible to say what kind of fungus it was, which enveloped the roots, but it seems probable that it is distinct from those forming the mycorhiza. It is by no means a rare occurrence to find fungus mycelium about beech roots, which seems to have no connection with the same. Masses of roots collected at Oran, Mo., during October were almost white in color because of some fungus surrounding the roots like a fine web. The smaller roots

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* Pfeffer, W. Druck und Arbeitsleistung durch wachsende Pflanzen. (Abh. d. könig. sächs. Ges. d. Wiss. **20**: 235–474. 1893.) —Newcombe, F. C. The influence of Mechanical Resistance on the Development and Life Period of Cells. (Bot. Gazette **19**: 149. 1894.)

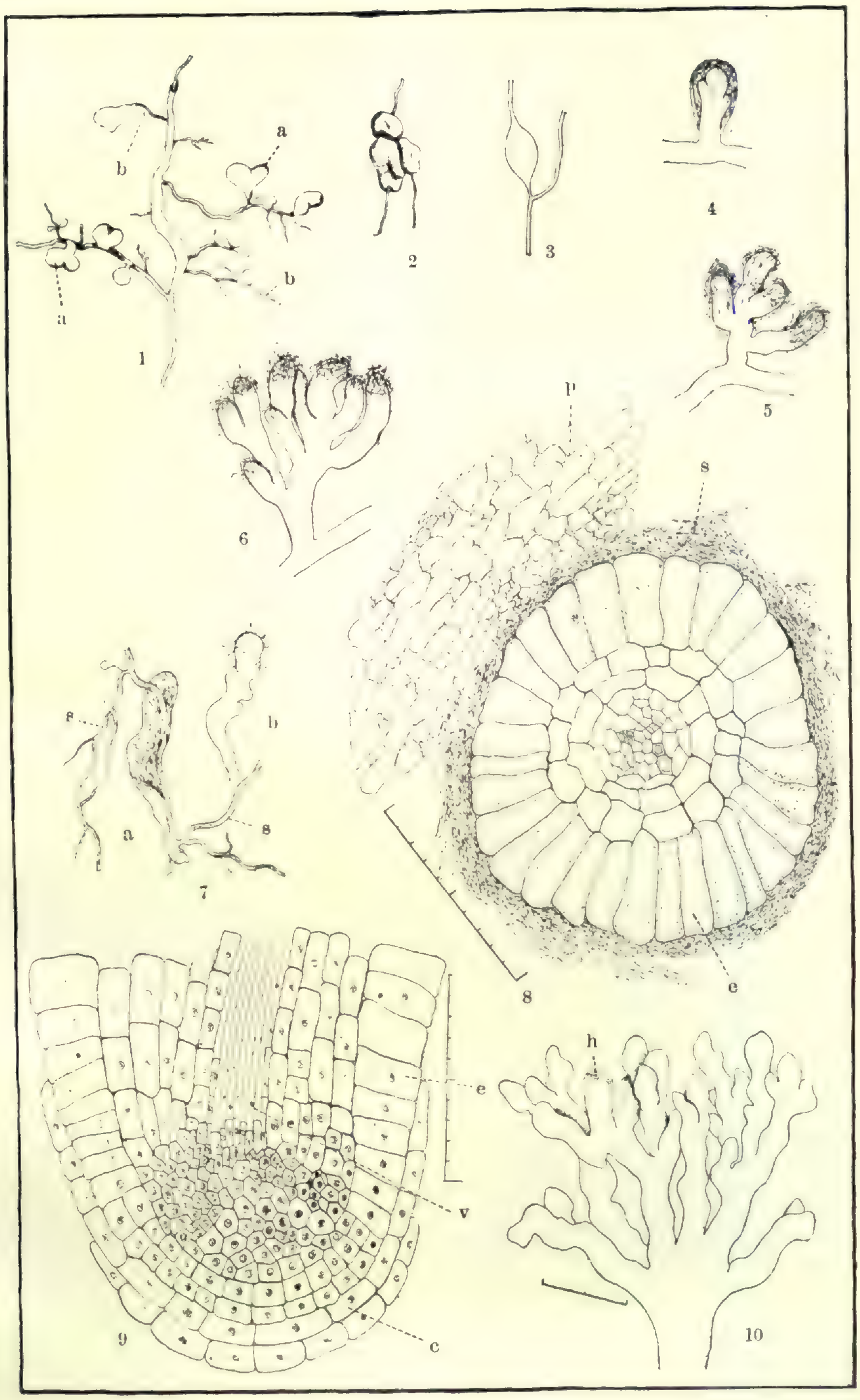
were much contorted, and like those in the tubercles, but each rootlet was covered with a sheath of fungus mycelium, like that of the typical mycorhiza. It is difficult to say whether this mycelium was distinct from that of the mycorhiza. I am inclined to think that it was, as it occurred in isolated spots, and only among definite clumps of trees, while all trees of that locality had the mycorhiza form of root. The occurrence of so many forms of mycelia, some apparently closely associated with the roots, laying claim to symbiotic relationship, others evidently more distinct from the root, such as the one which formed the tubercles, suggests that the problem of the root fungi in relation to trees is still an open one.

EXPLANATION OF PLATES ILLUSTRATING SCLEROTIOID DISEASE OF BEECH ROOTS.

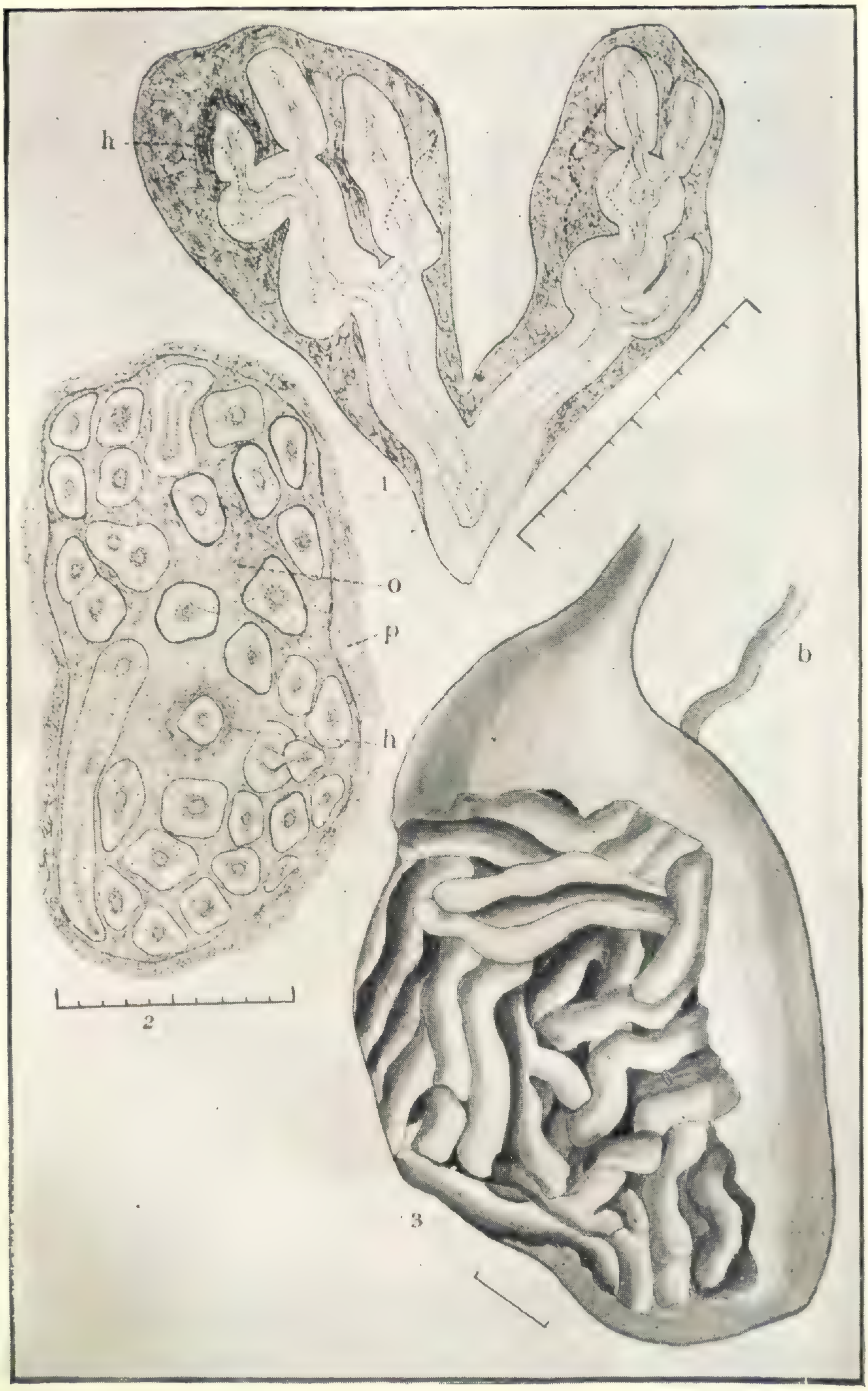
Plate 55. — 1, Beech root from Grand View, N. Y., showing sclerotioid bodies 'a' with fungus strands 'b' leading from each one (× 3). 2, Large tubercle, composed of three smaller ones, whose sheaths have united (× 1). The various depressions indicate separate masses of roots. A fungus strand comes from each mass. 3, A small sclerotium found near the beech roots (× 4). 4, Optical section of early stage of tubercle; covered with fungus sheath and showing two branches originating close to the root-tip (× 6). 5, An older stage of a tubercle (× 6). The fungus sheath has been removed, and the branches are spread out. Some of the fungus threads adhere to the roots. 6, Still more advanced stage, roots spread out (× 6). 7, a, The beginning of a tubercle, 's' fungus strands growing over a root, and spreading out forming a sheath (× 7); b, sheath removed, showing three branches just appearing (× 7). 8, Transection of root from tubercle, with a portion of the sheath; 'p' outer layer of sheath, composed of fungus threads of large diameter; 's' inner layer of sheath; 'e' epidermis of root. 9, Longisection through tip of root, slightly diagrammatic; the enveloping fungus hyphae have been omitted; 'c' two-layered root cap; 'e' epidermis; 'v' plerome cylinder. 10, A small portion of roots from a tubercle. Each branch keeps on growing, and forms branches constantly. The line at the side equals 2 millimeters; 'h' double layer of fungus hyphae around the root-tip.

Plate 56. — 1, Longisection of a young tubercle, reconstructed from

25 sections. Two adjacent rootlets have been covered by the fungus. 2, Transection of tubercle. All roots but two are cut transversely; 'h' double layer of hyphae; 'p' outer layer of sheath; 'o' mass of fine fungus threads surrounding each root and holding it in place. 3, Small tubercle, from which the fungus sheath has been partially removed, exposing the coiled mass of rootlets lying underneath; 'b' the strand from which the sheath developed. The line at the side equals 1 millimeter.



SCLEROTIOID DISEASE OF BEECH ROOTS.



SCLEROTIOID DISEASE OF BEECH ROOTS.

SPECIAL PUBLICATIONS.

EDWARD LEWIS STURTEVANT.

A Biographical Sketch.

BY C. S. PLUMB.

The gift of Dr. E. Lewis Sturtevant to the Missouri Botanical Garden of his extensive and valuable library of Prelinnean works, was an event in the history of this institution. This collection of books, which contains many rarities, was secured only through years of searching and at great expense. Its equal probably does not exist to-day in America.

The recent death of Dr. Sturtevant is a matter of more than passing moment to those interested in the work of this Garden. He was one of its benefactors, was interested in its work, and was a botanical student through many years of his life. In donating his library to this institution, he did it with the belief that here in future was to be one of the world's greatest botanical gardens, where such a collection of books would prove of far-reaching influence.

Edward Lewis Sturtevant was born in Boston, Mass., Jan. 23, 1842. His father and mother died within a short time of each other, in Philadelphia, Pa., shortly after the birth of his brother, Joseph N. When a small boy, with his aunt and guardian, Mrs. Benson, he moved to Winthrop, Maine, the birthplace of his father, where he resided for some time. He attended school there, and later went to New Jersey to a preparatory school. At 17 years of age he entered the class of '63 at Bowdoin College, in Maine, withdrawing in his senior year to enlist in the army. In

September, 1862, he was appointed First Lieut. of Co. G. of the 24th regiment of Maine Volunteers, and the next January was made Captain of his company. He served with the 19th army corps on the lower Mississippi, and was present at the siege of Port Hudson. A portion of his army service was on the staff of General Nickerson, 3rd brigade, 2nd division, with the rank of Captain. His career in the army was brought to a close by an attack of typhoid malaria, which necessitated his return home.

Soon after his return from the war, he entered the Harvard University Medical School, from which he received the degree of M. D. in 1866. The degrees of B. A. and A. M. were also conferred upon him by Bowdoin at different times in his early career.

Notwithstanding the degree of M. D. had been bestowed upon him, he never practiced medicine. After his graduation from Harvard, E. Lewis and his brother Thomas lived with their wives in the same home in Boston for a year or so. In 1867, with his brothers Joseph N. and Thomas, he purchased and resided on what afterwards became well known as "Waushakum Farm." Here with his brothers, he gave his attention to agricultural affairs. The farm became a field for practical research work, while his library offered another field of research, which he was not slow to make use of.

Waushakum Farm soon became celebrated as the home of Ayrshire cattle, and as the place of development of Waushakum Flint corn.

These two brothers became greatly interested in Ayrshire cattle, a large herd was maintained for some years, and extensive milk records kept. The writer doubts if there are in America milk records of twenty-five years ago, that are so extensive and cover so many milking periods, and different animals, as the Sturtevant Brothers kept. They made a careful study of the Ayrshire breed of cattle and finally in 1875 published a monograph of 252 pages

concerning this breed. This volume exists to-day as the only book of importance on Ayrshires outside of the herd book, that has been published in the English language.

With a herd of dairy cows at his disposal, Dr. Sturtevant became interested in the physiology of milk and the subject of milk secretion. He made active use of the microscope, and lectured early in the seventies before agricultural associations on this important topic. Among other things, his diagrams illustrating variations in size of fat globules in milk of different breeds of cows attracted much attention.

Dr. Sturtevant began his agricultural work in 1867, and among the first things to engage his attention was Indian corn, a plant he was constantly studying for 30 years, or nearly to the time of his death. He wrote many articles on Indian corn, addressed many agricultural societies and carried on extensive observations concerning it, both in farm practice and on the experimental field. One of the important pieces of corn work which he conducted in his early career on the farm, was to improve by selection and otherwise, a form of Canadian Yellow Flint which afterwards became widely known as Waushakum corn. This was bred with such care that 125 bushels of shelled corn to the acre have been grown on Waushakum Farm from its seed.

In addition to the work in developing this variety of corn, Dr. Sturtevant also improved a variety of muskmelon, which he called the New Christiana, a salmon fleshed melon of unusual sweetness, quality and amount of flesh.

Late in the fall of 1875, a lysimeter embracing five thousandths of an acre in size and 25 inches deep, was put in on Waushakum Farm. This was, so far as I am aware, the first lysimeter built in America. Its purpose was to study the percolation of moisture through a given area of soil under agricultural conditions. The apparatus was completed Nov. 19, 1875, and up to Jan. 1, 1880, careful record was made of all the water of filtration. At the

Cincinnati meeting of the American Association for the Advancement of Science, in 1881, Dr. Sturtevant gave a statement of the records of this lysimeter for the years 1876–1879 inclusive.

So intense became his interest in things agricultural, and so fertile was he in suggestions relative to agricultural problems, that he came to be quite in demand as a speaker before agricultural societies. He delivered many addresses in the seventies before boards of agriculture, dairy associations, etc., and gradually his reputation as an advanced agricultural thinker and scientist spread over New England and the Middle States. So favorably was he known, that in 1882 the newly created board of trustees of the New York State Agricultural Experiment Station invited him to become Director and organizer of the station. This position he accepted, removing to Geneva with his family and taking up the development of this new work. There was but little for him to pattern after. None of the stations organized under the Hatch Act of Congress was then in existence. Connecticut, on July 11, 1877, had organized a modest station, which was mainly a chemical laboratory, and Massachusetts, New Jersey, North Carolina and perhaps one or two other States had begun the work of organization before New York, but the latter State was the first to plan on an extensive scale. Scarcely anything but chemical research work had been accomplished, unless we except some field and feeding experiments carried on in a small way by the agricultural departments of some of the State colleges. Dr. Sturtevant began to develop the Station as a several-sided institution. Chemical, botanical, horticultural, live stock and crop departments were established. Within two or three years a working plant was organized and put into operation, that at that time received much attention from agriculturally interested persons. The chemical work of Babcock and Ladd, the botanical work of Arthur, the horticultural work of Goff and the field and

feeding experiments of the Director, made the name of the Station and their investigations well and favorably known before Dr. Sturtevant's administration ceased. The work of these men was the foundation upon which has been erected the splendid station of to-day at Geneva.

In 1887, Dr. Sturtevant resigned his Directorship of the New York station, and returned to South Framingham to reside in the old home. Here, however, conditions were greatly changed. During his absence at Geneva, the growth of South Framingham had caused the brothers to plat off the farm into streets and building lots, where at the present time are many comfortable dwellings. And then Waushakum Farm passed out of existence. Here in the old home, however, he resided, devoted to his family and books. Near by the house he erected a small building for a library, which he designated as his "Den," and in which he wrote. In 1893, he became quite ill with la grippe, which finally assumed the phase of tuberculosis. Unable to secure relief in the Massachusetts climate, he spent three winters in southern California, part of the time entirely absent from his family and intimate friends. This absence while greatly beneficial, chafed him, so that he did not return after his third visit, preferring to remain at home and accept conditions as they were. But his hold upon life was not thereby strengthened, and he gradually failed until July 30, 1898, when he quietly dropped asleep forever.

On the back leaves of a volume of his Agricultural Essays, that he had bound in for annotation, are a number of definitions, aphorisms, or sayings in his own unique and characteristic handwriting, undoubtedly the product of his own thought. Some of these are worthy of record here, as for example: —

"Agriculture is a complex art. To be a good farmer requires varied abilities and a sound judgment."

"The farmer who deals so exclusively with nature in her varied moods,

must ever remember that he cannot originate but only turn to good account the results of thoughtful observations and studied experiences."

"The season is much, the farmer is more. Crops follow judgment more than the weather."

"Agriculture as an art and a science, must be progressive, otherwise it will fail to keep pace with the requirements of our age."

"Any class of men who have not thought-makers among them, must become hewers of wood and the drawers of water. This is a social law. In education must be the farmer's hope, in thought-power must be the reliance of farmers."

"The peril to agriculture is to come more from personal ignorance than from other's competition; not higher prices, but cheap food and intelligence are for the continued and best interests of the country, the farmer included. The farmer should consider himself, both for his own welfare and as a fact, a citizen rather than as belonging to a class."

During all his life, Dr. Sturtevant was industrious with his pen. A great reader, and with an extensive private library at his command, he stowed away in his retentive memory, or in card note form, much to assist him in his subsequent work. An examination of his writings in pamphlet or book form will show foot-note references to an extent seldom seen. During his life, he had accumulated many thousand notes on cards, which he filed away and found of constant use. I counted in his library this summer over 170 small card catalogue boxes, each of which would hold about 75 cards. In these he gathered together an agricultural dictionary, and thousands of miscellaneous notes on things agricultural, botanical and historical. Later he had a large wooden case built, containing 30 drawers for cards, about 20 of which he filled with thousands of cards. Between 1883 and 1896 he inscribed notes on these cards, and among the last things he attended to a few weeks before his death, was to see that these were presented to the Missouri Botanical Garden, where he felt that they would meet with appreciative use.

While Director of the New York Station he became greatly interested in agricultural plants, and commenced to gather historical data concerning them. After exhausting

the library at his disposal, he began to purchase the works of old botanical writers, and thus continued his search. This led to the expenditure of large sums of money and the gradual accumulation of the finest Prelinnean library in the United States. An extensive importing house in New York made him constant shipments of rare old botanical or agricultural works, and thousands of dollars were thus spent. Being desirous that this valuable collection should be kept intact and yet in a place where it might be available to students, in 1892 Dr. Sturtevant donated these volumes to the library of the Missouri Botanical Garden. The size of the collection is indicated somewhat from the fact that it numbers over 500 titles and many more volumes than that. A list of the books occupies 86 octavo pages in the seventh annual report of the Missouri Botanical Garden. In the words of Dr. Trelease, "No conditions were attached to this gift, though it was suggested that the collection be kept in a group by itself." It is accordingly kept by itself and is known as "The Sturtevant Prelinnean Library."

Dr. Sturtevant was an active member and one of the founders of the Society for the Promotion of Agricultural Science, and presented a number of papers before its sessions during his life. He served as its first secretary and fourth president. He was also a Fellow in the American Association for the Advancement of Science.

The pen contributions of Dr. Sturtevant cover about 30 years and number many titles. He was a facile writer, and, until sickness incapacitated him, found time to furnish contributions of a scientific character to *Science*, *American Naturalist*, *Botanical Gazette*, *Torrey Botanical Club Bulletin* and several learned societies.

In his library I found 12 scrap book volumes, some nine by seven inches, of about 100 pages each, filled with his writings, cut from agricultural and other journals, these extending from November 2, 1867, to October 6, 1896.

The last article was from *Science*, and was a brief note relative to some "new apples," and two different colored dahlias found growing on one stem. Besides these, there were two bound volumes of his own writings, one containing 22 pamphlets ranging from three or four to 67 pages, and all published prior to 1882 and mainly in the seventies, while the other contained 42 pamphlets, additional to some experiment station documents.

On June 1, 1875, the first number of the *Scientific Farmer* was published. In March, 1876, the subject of this sketch joined with E. H. Libbey, then editor, in editing that paper. In May, 1878, the first number of the *Scientific Farmer* with E. Lewis Sturtevant as sole editor and proprietor, was issued. This journal, however, which was rather in advance of the times, did not prove a success, and was discontinued in October, 1879. It contained a large amount of information in relation to agricultural science, and was contributed to by the prominent men of the day in agricultural investigation.

As a student of the history and botanical characteristics of maize, Sturtevant was without a peer in the world. During his whole life, after settling on the farm, this subject engaged his attention. At the New York Station he grew varieties of corn from seed secured from all over America and abroad, and made an extensive botanical classification from field study, which was fully illustrated, and published in the reports of that station.

A year or two before his death, at the request of the United States Department of Agriculture, he prepared and furnished the Department the manuscript concerning varieties of maize, which Director True of the Office of Experiment Stations of the Department, informs me will soon appear as Bulletin 57 of that Division.

Five children survive him, of whom two sons and two daughters were by a first wife, to whom he was married in 1864, and one son by a second wife, to whom he was mar-

ried in 1882. He took great pride in his family, to which he was much devoted, and rarely sought companionship outside their midst. While at Geneva his wife and eldest daughter took keen interest in his studies of agricultural plants, and made under his direction hundreds of beautiful colored and other drawings of varieties and types of ears of corn and other plants, many of which served to illustrate his writings and especially those on maize, as published in the New York Station report for 1884.

A man of less than average height and weight, and nervous temperament, Dr. Sturtevant was a thinker of the most active type. He was gifted with great fertility of thought, as his coworkers at Geneva and intimate friends well know. Said one of those who had known him long, "Dr. Sturtevant was one of the most remarkable men I ever knew, to suggest new ideas to others and set them to thinking."

His early training had given him liberal views, and he was well informed on topics of the time outside of his own special sphere of work. Such an industrious reader and lover of books could hardly be otherwise. He was not a great mingler with men, but he had a wide circle of friends, whose friendship he prized. Without a distinctive agricultural education, such as may be secured in the agricultural colleges of to-day, he had such a natural trend of mind in this direction, that he readily accomplished by the aid of his University training, what but few men in his generation could have done. Unquestionably the world is richer for his life, and mankind is his beneficiary.

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While at the New York Station, between July 24, 1882, and March, 1887, Dr. Sturtevant published from the Station under his own name 124 newspaper bulletins, from one half to two columns long, covering many different subjects in a brief way and relative to work in progress at the Station.

In one of the bound volumes of essays of Dr. Sturtevant, is a list of titles and sources of publication of 97 "newspaper contributions that I desire to remember, to date, Jan. 1, 1882." These include many topics, but notably on dairying and dairy cattle, agricultural education and experiment stations, corn growing, farm wastes, etc.

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BY WILLIAM TRELEASE.

Academia nacional de ciencias en Cordoba.
BULLETIN.* Buenos Aires. O.
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ANNUARIO.* Porto. O.
Academia română.
ANALELE.* Bucuresci. Sq. Q.
Academia technica badensis. — See Grossherzogliche technische Hochschule, Karlsruhe.
Académie d'Angers. — See Société nationale . . . d'Angers.
Académie d'Hippone.
BULLETIN.* Bone. Q.
COMPTES-rendus des réunions.* Bone. Q.
Académie de La Rochelle. — See Société des sciences naturelles de la Charente-Inférieure.
Académie de Stanislas.
MÉMOIRES.* Nancy. O.
Académie de Vaucluse.
MÉMOIRES.* Avignon. Q.
Académie des belles-lettres, sciences et arts de La Rochelle. — See Académie de La Rochelle.
Académie des sciences. [Institut de France].
COMPTES rendus hebdomadaires. Paris. Q.
Académie des sciences, arts et belles-lettres de Dijon.
MÉMOIRES.* Dijon. O.
Académie des sciences, belles-lettres et arts de Rouen.
PRÉCIS analytique des travaux.* Rouen. O.

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* Presented, or received in exchange for the publications of the Garden.

Académie des sciences de Cracovie. — See Akademia umiejętności.

Académie des sciences de Hongrie. — See Királyi magyar természettudományi társulat.

Académie des sciences de l'Empereur François Joseph I. — See Česká akademie císaře Františka Josefa I.

Académie hongroise des sciences. — See Királyi magyar természettudományi társulat.

Académie impériale des sciences de St. Pétersbourg.

BULLETIN.* St. Pétersbourg. Q.

Académie internationale de géographie botanique.

BULLETIN.* Le Mans. Q.

Académie nationale des sciences, arts et belles-lettres de Caen.

MÉMOIRES.* Caen. O.

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ACTES. Paris. O.

Académie royale des sciences et des lettres de Danemark. — See Kongelige danske Videnskabernes Selskab.

Academy of natural sciences of Philadelphia.

JOURNAL. Philadelphia. F[5].

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Academy of science of Kansas City.

TRANSACTIONS.* [Kansas City, Mo.]. O.

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Accademia gioenia di scienze naturali in Catania.

ATTI.* Catania. O.

BOLLETTINO delle sedute.* Catania. O.

Accademia reale delle scienze di Torino. — See Reale accademia delle scienze di Torino.

Agassiz association. — See Wilson ornithological chapter.

Agiati. — See Imperiale reale accademia . . . degli,.

Agri-horticultural society of Madras.

PROCEEDINGS.* Madras. O.

Agricultural college of Utah. Experiment station. [Logan].

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Alumni association of the college of pharmacy of the city of New York. — See Journal of pharmacology.

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America. — See Botanical society of.,
American academy of arts and sciences.
MEMOIRS.* Cambridge. Sq. F.
PROCEEDINGS.* Boston. O.
AMERICAN agriculturist.* New York. F.
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American association for the advancement of science.
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American forestry association. — See The Forester.
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AMERICAN gardening. New York. Q.
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American microscopical society.
TRANSACTIONS. Buffalo. O.
AMERICAN monthly microscopical journal.* Washington. O.
American museum of natural history.
ANNUAL report of the president.* New York. O.
BULLETIN.* New York. O.
AMERICAN naturalist.* Boston. Q.
American philosophical society.
PROCEEDINGS.* Philadelphia. O.
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PROCEEDINGS. ——. O.
Amiens. — See Chambre syndicale . . . d' Amiens.
Amsterdam. — See Koninklijke akademie van wetenschappen te,. — Université d'Amsterdam.
Angers. — See Société d'études scientifiques d'Angers. — Société nationale . . . d'Angers.

Annaberg-Buchholzer Verein für Naturkunde.
BERICHT.* Annaberg. O.
ANNAES de sciencias naturaes.* Porto. O.
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ANNALS of botany. London and Oxford. Q.
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Antigua. Government laboratory.
REPORT.* Antigua. F.
Antonio Alzate. — See Sociedad científica,.
Antverpiensis. — See Hortus botanicus,.
APPLETONS' popular science monthly. New York. O.
Argentina. — See Sociedad científica,.
Arizona. — See University of,.
Arkansas agricultural experiment station. [Fayetteville].
BULLETIN.* Fayetteville. O.
REPORT.* Little Rock. O.
Arnigadh. — See Government botanical gardens Saharanpur and,.
Arnstadt. — See Thüringische botanische Gesellschaft "Irmischia" zu,.
ASA GRAY bulletin.* Washington. O.
Asiatic society of Bengal.
JOURNAL.* Calcutta. O.
Associated natural history societies of the South East of England. — See South Eastern naturalist.
Association française de botanique. — See Le Monde des plantes.
Association française pour l'avancement des sciences.
COMPTE rendu.* Paris. O.
Association of economic entomologists.
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Ateneo di scienze lettere ed arti in Bergamo.
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Auckland institute. — See New Zealand institute.
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Australian museum.
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REPORT of trustees.* [Sydney]. F.
Autun. — See Société d'histoire naturelle d'Autun.
Bacteriological review. — See Modern medicine.
Badensis. Hortus botanicus . . . ,. — See Grossherzogliche technische Hochschule in Karlsruhe.
Badischer botanischer Verein.
MITTEILUNGEN.* Freiburg i.B. O.
Bamberg. — See Naturforschende Gesellschaft in,.
Bangalore. — See Government gardens and parks in Mysore.
Barbados. — See Botanical station,. — Dodds reformatory,.
Basel. — See Naturforschende Gesellschaft in,.
Basse-Alsace. — See Gesellschaft zur Förderung der Wissenschaften . . . im Unter-Elsass.
Bayerische botanische Gesellschaft.
BERICHTE.* München. Q.
BEIHEFTE zum Botanischen Centralblatt. Cassel. O.
Belfast natural history and philosophical society.
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Belge. — See Société, de microscopie.
Belgique. — See Société centrale forestière de,. — Société royale de botanique de,.
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Bengal. — See Asiatic society of,.
Bergamo. — See Ateneo . . . in,.
Bergens Museum.
AARBOG.* Bergen. O.
Bergielunds botaniska trädgård. (Hortus bergianus stockholmiensis.)
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Berlin. — See Gesellschaft naturforschender Freunde zu,. — Königlich-preussische Akademie der Wissenschaften zu.,— Königlicher botanischer Garten und Museum zu,.

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Biological society of Washington.

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Boston. — See City of,.

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Botanical department, Jamaica.

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Botanischer Garten in Freiburg i.B. — See Grossherzoglich-badische . . . Universität.

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Botanischer Garten zu Darmstadt. — See Technische Hochschule Darmstadt.

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Arbeiten.* Hamburg. Q.
Mitteilungen.* Hamburg. Q.
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Braunschweig. — See Herzoglich-braunschweigische forstliche Versuchsanstalt. — Technische Hochschule . . . zu,. — Verein für Naturwissenschaft zu,.
Bremen. — See Naturwissenschaftlicher Verein zu,.
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Report. London. O.
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REPORT.* Georgetown. F.
British museum. (Natural history).
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Budapest. — See Királyi magyar természettudományi társulat. — Magyar nemzeti múzeum.
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Calcutta. — See Royal botanic garden,.
California. — See University of,.
California academy of sciences.
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California fruit bulletin. — See Pacific rural press.
Cambridge entomological club. — See Psyche.
Cambridge philosophical society.
PROCEEDINGS.* Cambridge. O.

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DELECTUS seminum.* Cantabrigiae. O.
Canada. — See Royal society of,.
Canada. Department of agriculture.
Central experimental farm.
BULLETIN.* Ottawa. O.
Experimental farms.
REPORTS.* Ottawa. O.
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Canadian institute.
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Cardiff naturalists' society.
REPORT & transactions.* Cardiff. O.
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Cawnpore experimental farm.
REPORT.* Allahabad. F.
LA CELLULE. Lierre, Louvain. Q.
CENTRALBLATT für Bakteriologie, Parasitenkunde und Infektionskrankheiten. Abteilung I, II. Jena. O.
Cercle d'arboriculture de Belgique. — See Bulletins d'arboriculture de floriculture, etc.
Cercle horticole de Roubaix.
BULLETIN mensuel.* Roubaix. O.
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Česká akademie císaře Františka Josefa I.

BULLETIN international.* Prague. Q.

ROZPRAWY.* v Praze. Q.

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Chambre syndicale professionnelle des horticulteurs & maraichers d'Amiens.

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Cherbourg. — See Société nationale des sciences naturelles et mathématiques de,.

Chester society of natural science and literature.

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Chicago.

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REPORT of South park commissioners.* Chicago. O.

Chicago academy of sciences.

ANNUAL report.* Chicago. O.

BULLETIN.* Chicago. O.

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Cincinnati society of natural history.

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ANNUAL report of the board of commissioners.*
[Boston]. O.
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City of London college science society.
JOURNAL.* London. O.
City of Louisville. Board of park commissioners.
ANNUAL report.* Louisville. O.
City of Milwaukee. Public museum.
REPORT of the board of trustees.* Milwaukee. O.
City of Rochester.
REPORT of the board of park commissioners.* [Rochester]. O.
City of St. Louis.
Board of commissioners of Tower Grove park.
ANNUAL report.* St. Louis. O.
Health department.
ANNUAL report of the health commissioner.* St. Louis. O.
STATEMENT of mortality, vital statistics . . . and local meteorology.* St. Louis. O.
Park commissioner.
ANNUAL report.* St. Louis. O.
City of Toledo. Board of park commissioners.
REPORT.* Toledo. O.
Claudinopolitanae. Hortus botanicus regiae universitatis,.
— See Kolozsvári . . . Ferencz-József-tudomány-egyetem.
Clemson agricultural college. — See South Carolina agricultural experiment station.
Coimbra. — See Universidade de,.
College of pharmacy of the city of New York. Alumni association. — See Journal of pharmacy.
Colmar. — See Naturhistorische Gesellschaft in,.
Colorado. — See Agricultural experiment station of,.
Colorado college scientific society.
COLORADO college studies.* Colorado Springs. O.

Colorado scientific society.
PROCEEDINGS.* Denver. O.
Columbia university.
COLUMBIA university quarterly.* New York. O.
PRESIDENT'S annual report.* New York. O.
Department of botany.
CONTRIBUTIONS.* New York. O.
MEMOIRS. New York. Q.
Columbus horticultural society.
ANNUAL report.* Columbus. O.
QUARTERLY journal of proceedings.* Columbus. O.
Commissioner of education. — See United States,.
Congo. — See Musée du,.
Conimbricensis. Hortus botanicus . . ., . — See Universidade de Coimbra.
Connecticut academy of arts and sciences.
TRANSACTIONS.* New Haven. O.
Connecticut agricultural experiment station. New Haven.
ANNUAL report.* Hartford. O.
BULLETIN.* New Haven. O.
——— See Storrs agricultural experiment station.
Connecticut board of agriculture.
REPORT of the secretary.* Hartford. O.
Conservatoire & jardin botaniques de Genève. — See Genève.
Consular reports. — See United States.
Cooper union for the advancement of science and art.
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CORNELL reading course for farmers.* [Ithaca]. O.
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Cracovie. Académie des sciences de,. — See Akademia umiejętnósci.
Croydon microscopical and natural history club.
Proceedings & transactions.* Croydon. O.
Curtis's botanical magazine. London. O.
Dairymen's association of British Columbia.
Report.* Victoria. Q.
Danske. — See Kongelige, Videnskabernes Selskab.
Danzig. — See Naturforschende Gesellschaft in,.
Darmstadt. — See Technische Hochschule,.
Dauphiné. — See Société des touristes du,.
Davenport academy of natural sciences.
Proceedings.* Davenport. O.
Delaware college agricultural experiment station [Newark].
Annual report.* Wilmington. O.
Bulletin.* Newark. O.
Denison university. Denison scientific association.
Bulletin of the scientific laboratories.* Granville. O.
Department of agriculture. — See United States.
Deutsche botanische Gesellschaft.
Berichte. Berlin. O.
Deutsche botanische Monatsschrift. Berlin. O.
Deutsche Forstmänner. — See Herzoglich-braunschweigische forstliche Versuchsanstalt.
Deutsche Gärtner-Zeitung. — See Möller.
Deutsche Gesellschaft für Natur- und Völkerkunde Ostasiens.
Mittheilungen.* Tokyo. O.
Deutsche Kakteen-Gesellschaft. — See Monatsschrift für Kakteenkunde.

Deutsche pharmaceutische Gesellschaft.
BERICHT über die pharmacognostische Litteratur . . .*
Berlin. O.
Deutscher wissenschaftlicher Verein zu Santiago de Chile.
VERHANDLUNGEN.* Valparaiso. O.
Deux-Sèvres. — See Société botanique des,.
DICTIONNAIRE iconographique des orchidées. Schaerbeck-Bruxelles. Ob. T.
—— — See Chronique orchidienne.
Dijon. — See Académie des sciences, arts . . . de,.
Dodds reformatory, Barbados. Experimental fields.
REPORT.* [Bridgetown]. F.
Dodonaea. — See Kruidkundig genootschap,.
Dominion of Canada. — See Canada.
Doria. — See Herbarium Camillae Doriae.
Dorpat. — See Imperatorskii jurjevskii universitet.
Douai. — See Société d'agriculture . . . séant à,.
Le Doubs. — See Société d'émulation du Doubs.
DRAINAGE journal.* Indianapolis. O.
Dresden. — See Königlich-sächsische . . . Hochschule,.
Drug clerks journal. — See Registered pharmacist.
DRUGGISTS circular [and Chemical gazette].* New York. Sq. F4.
Dublin. — See Royal botanic gardens, Glasnevin,.
Durban botanic society. — See Natal botanic gardens.
East Kent scientific and natural history society.
REPORT.* Canterbury. O.
Edgbaston botanical gardens. — See Birmingham botanical and horticultural society.
Edinburgh. — See Botanical society of,. — Royal botanic garden,.
Edinburgh field naturalists' and microscopical society.
TRANSACTIONS.* Edinburgh. O.
EDUCATIONAL review.* St. John. Q.
Égyptien. — See Institut,.
Elberfeld. — See Naturwissenschaftlicher Verein zu,.

Elisha Mitchell scientific society.
JOURNAL.* Chapel Hill. O.
Elsass. — See Gesellschaft zur Förderung der Wissenschaften . . . im Unter-Elsass.
Emden. — See Naturforschende Gesellschaft in,.
England. — See Royal agricultural society of,.
Entomological society of Ontario.
REPORT.* Toronto. O.
—— — See Canadian entomologist.
Erdélyi múzeum-egylet.
ÉRTESITÖ.* Kolozsvárt. O.
Erfurt. — See Königliche Akademie gemeinnütziger Wissenschaften zu,.
Erlangen. — See Königliche Universität,.
ERYTHEA. Berkeley. O.
Española. — See Sociedad, de historia natural.
Essex county, New Jersey. Department of parks.
ANNUAL report.* Newark. O.
Essex institute.
BULLETIN.* Salem. O.
État indépendant du Congo. — See Musée du Congo.
EXPERIMENT station record.* Washington. O.
Experimental farms. — See Canada.
FARM field and fireside.* Chicago. F.
Fennica. — See Societas pro fauna et flora,.
Ferdinandeum für Tirol und Vorarlberg.
ZEITSCHRIFT.* Innsbruck. O.
Ferencz-József-tudomány-egyetem. — See Kolozsvári.
THE FERN bulletin.* Binghamton. O.
Ferrara. — See Universitas ferrariensis.
FEUILLE des jeunes naturalistes.* Paris. Q.
Field Columbian museum publication.
BOTANICAL series.* Chicago. Q.
REPORT series.* Chicago. Q.
Field naturalists' club of Victoria. — See Victorian naturalist.

FLORA oder allgemeine botanische Zeitung. Marburg. O.
Florentinus. Regius hortus botanicus,. — See Reale istituto di studi etc.
Florida agricultural experiment station. [Lake City].
BULLETIN.* Jacksonville. O.
REPORT of the biologist and horticulturist.* [Lake City]. O.
FLORISTS' exchange.* New York. Q.
Florists' review. — See Weekly florists' review.
FOREST leaves. Philadelphia. Q.
THE FORESTER.* Washington. Q.
Française. — See Association, de botanique. — Association, pour l'avancement des sciences.
France. — See Institut de,. — Société botanique de,. — Société mycologique de,.
Francisco-carolinum. — See Museum,.
Frankfurt. — See Naturwissenschaftlicher Verein des Regierungsbezirkes,.
Frankfurt am Main. — See Senckenbergische naturforschende Gesellschaft in,.
Franklin institute.
JOURNAL.* Philadelphia. O.
Františka Josefa I. — See Česká academie císaře,.
Freiburg i.B. — See Grossherzoglich-badische . . . Universität. — Naturforschende Gesellschaft zu,.
Fribourgeoise. — See Société, des sciences naturelles.
Fruit growers' association of Ontario. — See Canadian horticulturist.
THE GARDEN. London. O.
THE GARDENERS' chronicle.* London. Sq. F.
THE GARDENERS' magazine.* London. F.
GARDENING.* Chicago. Q.
GARDENING illustrated. London. F.
Gartenbau-Gesellschaft in Wien. — See Wiener illustrirte Garten-Zeitung.
GARTENFLORA.* Berlin. Q.

DIE GARTENWELT.* Berlin. Q.
Geisenheim. — See Königliche Lehranstalt . . . zu,.
Genève. — See Société botaniqué de,. — Société de physique et d'histoire naturelle de,. — Université de,.
Genève.
Conservatoire & jardin botaniques.
ANNUAIRE.* Genève. O.
Jardin botanique.
CATALOGUE des graines.* [Genève]. O.
Gent. — See Hoogeschool te,. — Kruidkundig genootschap Dodonaea te,.
Geological and natural history survey of Minnesota.
BULLETIN. Botanical series. (Minnesota botanical studies).* Minneapolis. Q.
Geological survey of Alabama.
BULLETIN.* Montgomery. O.
REPORT.* Montgomery. O.
Georgia experiment station. [Experiment].
BULLETIN [with appended report].* Atlanta. O.
Gera. — See Gesellschaft von Freunden der Naturwissenschaften in,.
Gesellschaft für Botanik zu Hamburg. — See Botanisches Centralblatt.
Gesellschaft naturforschender Freunde zu Berlin.
SITZUNGS-Berichte.* Berlin. O.
Gesellschaft von Freunden der Naturwissenschaften in Gera (Reuss).
JAHRESBERICHT.* Gera. O.
Gesellschaft zur Beförderung der gesammten Naturwissenschaften zu Marburg.
SITZUNGSBERICHTE.* Marburg. O.
Gesellschaft zur Förderung der Wissenschaften, des Ackerbaues und der Künste im Unter-Elsass.
MONATSBERICHT.* Strassburg. O.
Gioenia. — See Accademia,.
Glasgow. — See Natural history society of,.
Glasnevin. — See Royal botanic gardens,.

Görlitz. — See Naturforschende Gesellschaft zu,.
Görlitz. Stadtischer botanischer Garten.
SÄMEREIEN.* Görlitz. O.
Göteborgs kungliga vetenskaps- och vitterhetssamhälle.
HANDLINGAR.* Göteborg. O.
Gouvernement's kinaonderneming.
MEDEDEELINGEN van de laboratoria.* Batavia. Q. etc.
Government agricultural experiment station for North Dakota. — See North Dakota.
Government botanical gardens, Saharanpur and Arnigadh.
REPORT.* Allahabad. F.
Government gardens and parks in Mysore.
ANNUAL report.* [Bangalore]. F.
Government horticultural gardens, Lucknow.
REPORT.* Allahabad. F.
Graaff-Reinet botanic gardens.
ANNUAL report.* Graaff-Reinet. F.
Grahamstown botanic gardens.
ANNUAL report.* Grahamstown. O.
Graubünden. — See Naturforschende Gesellschaft Graubünden's.
Gray. — See Asa Gray bulletin.
Great Britain. — See Pharmaceutical society of,.
GREEN's fruit grower and home companion. Rochester. Sq. F[6].
Greene, E. L. — See Pittonia.
Greifswald. — See Königliche Universität,. — Naturwissenschaftlicher Verein für Neu-Vorpommern . . .in,.
Greiz. — See Verein der Naturfreunde zu,.
Grenada. — See Botanic garden,.
Grenoble. — See Université de,.
Groningen. — See Natuurkundig genootschap te,. — Université de Groningue.
Grossherzoglich - badische Albert - Ludwigs - Universität. Botanischer Garten in Freiburg i.B.
SAMEN-Verzeichnis.* Freiburg i.B. Sq. Q.

Grossherzogliche technische Hochschule. Grossherzoglicher botanischer Garten zu Karlsruhe i.B.
SAMEN-Verzeichnis.* Karlsruhe. Q.
Grossherzoglicher botanischer Garten, Darmstadt. — See Technische Hochschule, Darmstadt.
Guiana. — See British,.
Haarlem. — See Koloniaal museum te,.
Halifax. — See Nova Scotian institute.
Halle. — See Naturforschende Gesellschaft zu,.
Hamburg. — See Botanisches Museum in,. — Botanisches Museum und Laboratorium . . . zu,. — Botanischer Verein in,. — Gesellschaft für Botanik zu,.
Hamilton association.
JOURNAL and proceedings.* [Hamilton]. Q.
Hanau. — See Wetterauische Gesellschaft . . . zu,.
Hannover. — See Naturhistorische Gesellschaft zu,. — Provinzial-Museum in,.
Harvard university.
Bussey institution. [Jamaica Plain].
BULLETIN.* Cambridge. O.
Cryptogamic laboratory.
CONTRIBUTIONS.* [Cambridge]. O.
Gray herbarium.
CONTRIBUTIONS.* [Cambridge]. O.
Harz. — See Naturwissenschaftlicher Verein des Harzes.
Hatch experiment station. — See Massachusetts agricultural college.
Hauniensis. Hortus. . .,. — See Kjøbenhavns Universitet.
La Haute-Saône. — See Société d'agriculture . . . de,.
Hawke's bay philosophical institute. — See New Zealand institute.
HEDWIGIA. Dresden. O.
Helgoland. Biologische Anstalt. — See Ministerial-Kommission zur Untersuchung der deutschen Meere in Kiel.
HELIOS.* Berlin. O.
Helsingfors. — See Societas pro fauna et flora fennica in,.

Helvétique. Société, des sciences naturelles. — See Schweizerische naturforschende Gesellschaft.

Henry Shaw school of botany.— See Washington university.

Herbarium Camillae Doriae.* Genova. Q.

Herbier Boissier. [Chambésy].

Bulletin.* Genève et Bâle. O.

Hermannstadt. — See Siebenbürgischer Verein für Naturwissenschaften zu,. — Verein für siebenbürgische Landeskunde.

Herzoglich-braunschweigische forstliche Versuchsanstalt.

[Publications].* Braunschweig. O.

Hippone. — See Académie d'Hippone.

Historical and scientific society of Manitoba.

Annual report.* Winnipeg. O.

Transactions.* Winnipeg. O.

Historical and philosophical society of Ohio.

Annual report.* Cincinnati. O.

Holstein. — See Naturwissenschaftlicher Verein für Schleswig-,.

Home and garden.* Minneapolis. F.

Home farmer. — See Journal of horticulture.

Home study magazine. — See Mechanic arts magazine.

Hongroise. Académie, des sciences. — See Királyi magyar természettudományi társulat.

Hoogeschool te Gent. Plantentuin.

Lijst der Zaden.* [Gent]. Q.

Hooker's icones plantarum. London. O.

Hortus academicus hauniensis. — See Kjøbenhavns Universitet.

Hortus bergianus stockholmiensis. — See Bergielunds botaniska trädgård.

Hortus botanicus academicus lugduno-batavus. See Rijks universiteit, Leiden.

Hortus botanicus, Amsterdam. — See Université d'Amsterdam.

Hortus botanicus antverpiensis.

Delectus seminum.* Antverpiae. O.

Hortus botanicus bernensis.
DELECTUS seminum.* Bern. F⁵.
Hortus botanicus christianensis. — See Kongelige Frederiks Universitet.
Hortus botanicus imperialis petropolitanus.
ACTA.* [St. Petersburg]. Q.
DELECTUS seminum.* [St. Petersburg]. O.
Hortus botanicus namnetum. — See Nantes.
Hortus botanicus tergestinus.
DELECTUS seminum.* Tergeste. Sq. Q.
Hortus botanicus tiflisiensis. — See Tiflisskiĭ botanicheskiĭ sad.
Hortus botanicus varsoviensis.
DELECTUS seminum.* Varshava. O.
Hortus lausonensis.
GRAINES offertes.* Lausanne. Q.
Hortus regius botanicus academicus conimbricensis. — See Universidade de Coimbra.
Hortus regius neapolitanus. — See Regia università . . . di Napoli.
Hortus upsaliensis. — See Kongliga universitet i Upsala.
HOW TO GROW flowers.* Springfield, Ohio. Q.
Hull scientific and field naturalists' club.
TRANSACTIONS.* Hull. O.
Hungarica. Regia societas scientiarum naturalium,. — See Királyi magyar természettudományi társulat.
Icones bogorienses. — See 's Lands plantentuin.
Icones plantarum. — See Hooker.
Idaho. — See University of.,
Illinois. — See University of,.
Illinois state laboratory of natural history.
BIENNIAL report of the director.* Urbana. O.
BULLETIN.* Urbana. O.
Illinois state museum of natural history.
BULLETIN.* Springfield. Q.

Imperatorskiĭ jurjevskiĭ unversitet. Hortus botanicus.
DELECTUS seminum.* [Dorpat]. Q.
I. S.-Peterburgskoe obstchestvo estestvoispytateleĭ.
TRUDY.* S.-Peterburg. O.
Imperial university of Tōkyō. Botanic garden.
CATALOGUS seminum.* [Tōkyō]. Sq. Q.
LIST of seeds.* [Tōkyō]. Q.
Imperiale reale accademia di scienze lettere ad arti degli Agiati in Rovereto.
ATTI.* Rovereto. O.
India. — See Botanical survey of,. — Scientific memoirs by medical officers of the army of,.
INDIAN forester.* Mussoorie. O.
Indiana. Department of geology and natural resources.
ANNUAL report.* Indianapolis. O.
Indiana academy of science.
PROCEEDINGS.* Indianapolis. O.
Indiana agricultural experiment station. — See Purdue university.
LA INDUSTRIA agricola.* Caracas. O.
Innsbruck. — See Kaiserlich-königliche Leopold-Franzens-Universität.
Institut colonial de Marseille.
ANNALES.* Marseille. Q.
Institut de Carthage. — See Revue tunisienne.
Institut de France. — See Académie des sciences.
Institut égyptien.
BULLETIN.* Le Caire. O.
MÉMOIRES.* Le Caire. Sq. Q.
Instituto físico-geográfico nacional de Costa Rica.
ANALES.* San José. F.
INFORME.* San José. Q.
Internationale phytopathologische Kommission. — See Zeitschrift für Pflanzenkrankheiten.
Iowa. — See State university of,.
Iowa academy of sciences.
PROCEEDINGS.* Des Moines. O.

Iowa geological survey.
ANNUAL report.* Des Moines. Q.
Iowa state agricultural society.
ANNUAL report.* Des Moines. O.
Iowa state college of agriculture and mechanic arts. [Ames].
Botanical department.
CONTRIBUTIONS.* Des Moines. O.
Department of zoology and entomology.
CONTRIBUTIONS.* Des Moines. O.
Experiment station.
BULLETIN.* Ames. O.
Iowa state horticultural society.
REPORT.* Des Moines. O.
Iowa weather and crop service. — See United States department of agriculture. Weather bureau.
Ireland. — See Pharmaceutical society of,.
Irmischia. — See Thüringische botanische Gesellschaft, zu Arnstadt.
Isis. — See Naturwissenschaftliche Gesellschaft,.
L' ITALIA agricola.* Milano, Piacenza, Bologna. Q.
Italiana. — See Società botanica,. — Società, di scienze naturali. — Stazioni sperimentali agrarie italiane. — Nuovo giornale botanico italiano.
JAHRBÜCHER für wissenschaftliche Botanik. Berlin. O.
JAHRESBERICHT über die Fortschritte in der Lehre von den pathogenen Mikroorganismen.* Braunschweig. O.
Jamaica. — See Botanical department,.
Japan. Japanese horticultural society. — Japanische Gartenbau-Gesellschaft. — See Société d'horticulture du Japon.
Jardin alpin d'acclimatation . . . Genève.
LISTE des graines.* — Genève. O.
Jardin botanique de Buitenzorg. — See 's Lands plantentuin.
Jardin botanique de Genève. — See Genève.

Jardin botanique de la ville, Lyon. — See Lyon.
Jardin botanique de la ville de Caen.— See Caen.
Jardin botanique de la ville de Lille. — See Lille.
Jardin botanique de Varsovie. — See Hortus botanicus varsoviensis.
Jardin botanique du royaume de Serbie, à Belgrade.
GRAINES, recoltées à "Jevremovac."* Belgrade. O.
Jardin des plantes, Paris. — See Muséum d'histoire naturelle.
Jardin impérial de botanique à St.-Pétersbourg. — See Hortus botanicus imperialis petropolitanus.
Java. — See Proefstation Oost-Java. — Proefstation . . . in West-Java.
JENAISCHE Zeitschrift für Naturwissenschaft.* Jena. O.
Jevremovac. — See Jardin botanique du royaume de Serbie.
JOHNS Hopkins university circulars.* Baltimore. Q.
JOURNAL de botanique. Paris. O.
——— See Botanisk Tidsskrift.
JOURNAL of applied microscopy.* Rochester. O.
JOURNAL of botany British and foreign. London. O.
JOURNAL of horticulture, Cottage gardener and Home farmer. London. Q.
JOURNAL of pharmacology and therapeutics.* New York. Q.
Jurjevensis. Hortus botanicus universitatis,. — See Imperatorskii jurjevskii universitet.
JUST'S botanischer Jahresbericht. Berlin. O.
Kärntnerisches naturhistorisches Landesmuseum. — See Naturhistorisches Landesmuseum von Kärnten.
Kagok-Tegal. — See Proefstation . . . te,.
Kaiserlich-königliche deutsche Universität in Prag. Botanisches Institut.
ARBEITEN. — See Österreichische botanische Zeitschrift.
K.-k. botanischer Garten.
SÄMEREIEN.* Prag. Sq. Q.

K.-k. Gartenbau-Gesellschaft in Steiermark.
MITTHEILUNGEN.* Graz. O.
K.-k. Landwirthschafts-Gesellschaft des Herzogthumes Salzburg.
RECHENSCHAFTS-Bericht des Central-Ausschusses.* Salzburg. O.
K.-k. Landwirthschafts-Gesellschaft in Salzburg. — See Salzburger Landwirthschafts-Blätter.
K.-k. Leopord-Franzens-Universität. Botanischer Garten.
VERZEICHNIS von Samen.* Innsbruck. Sq. Q.
K.-k. zoologisch-botanische Gesellschaft in Wien.
VERHANDLUNGEN.* Wien. O.
—— — See Botanisches Centralblatt.
Kaiserlich-königlicher botanischer Garten in Prag-Smichow. — See K. k. deutsche Universität in Prag.
Kaiserlich-königliches naturhistorisches Hofmuseum.
ANNALEN.* Wien. Q.
Kaiserlich-leopoldinisch-carolinische deutsche Akademie der Naturforscher.
NOVA acta (Abhandlungen). Halle. Q.
Kaiserliche Akademie der Wissenschaften.
ALMANACH. Wien. D.
DENKSCHRIFTEN. Wien. Sq. Q.
SITZUNGSBERICHTE, Mathematisch-naturwissenschaftliche Classe.* Wien. Q.
Kansas academy of science.
TRANSACTIONS.* Topeka. O.
Kansas City. — See Academy of science of,.
Kansas state agricultural college. Experiment station.
BULLETIN [with appended report].* Manhattan. O.
PRESS bulletin.* Manhattan. O.
Kansas state horticultural society.
TRANSACTIONS.* Topeka. O.
KANSAS university quarterly. Series A: — Science and mathematics.* Lawrence. O.
Karlsruhe i.B. — See Grossherzogliche technische Hochschule.

Karlsruhe i.B. Stadtgarten.

SÄMEREIEN aus dem Schulgarten.* Karlsruhe. O.

Kassel. — See Verein für Naturkunde zu,.

Kazan. — See Obstchestvo estestvoispytatelei pri imperatorskom kazanskom universitete.

Kaukasisches Museum.

BERICHT.* Tiflis. O.

IZVYESTIYA.* Tiflis. O.

MITTHEILUNGEN.* Tiflis. O.

Kentucky agricultural experiment station of the State college of Kentucky.

ANNUAL report.* Lexington. O.

BULLETIN.* Lexington. O.

Kew. — See Royal gardens,.

Kew guild.

JOURNAL.* London. O.

Kiel. — See Ministerial-Kommission zur Untersuchung der deutschen Meere in,.

Kievskoe obstchestvo estestvoispytatelei.

ZAPISKI.* Kieff. O.

Királyi magyar természettudományi társulat.

[MONOGRAPHS].* Budapest. O. & Q.

RAPPORT sur les travaux de l'Académie hongroise des sciences.* Budapest. O.

——— — See Mathematische und naturwissenschaftliche Berichte aus Ungarn.

Kjøbenhavn. — See Botaniske Forening i,. — Naturhistoriske Forening i,. — Société botanique de Copenhague.

Kjøbenhavns Universitet. Botaniske Have.

INDEX seminum.* Hauniae. O.

Klagenfurt. — See Naturhistorisches Landesmuseum von Kärnten.

Klausenburg. — See Kolozsvári magyar kiralyi Ferencz-József-tudomány-egyetem.

Königlich botanischer Garten zu Dresden. — See Königlich-sächsische . . . Hochschule.

Königlich-bayerische Akademie der Wissenschaften zu München.

SITZUNGSBERICHTE der mathematisch-physikalischen Classe.* München. O.

K.-b. botanische Gesellschaft zu Regensburg.

DENKSCHRIFTEN.* Regensburg. Sq. Q.

K.-böhmische Gesellschaft der Wissenschaften.

JAHRESBERICHT.* Prag. O.

SITZUNGSBERICHTE. Mathematisch-naturwissenschaftliche Classe.* Prag. O.

K.-preussische Akademie der Wissenschaften zu Berlin.

SITZUNGSBERICHTE. Berlin. Q.

K.-sächsische technische Hochschule Dresden. Königlich botanischer Garten.

VERZEICHNIS der . . . Sämereien.* Dresden. O.

K.-ungarische naturwissenschaftliche Gesellschaft. — See Királyi magyar természettudományi társulat.

Königliche Akademie gemeinnütziger Wissenschaften zu Erfurt.

JAHRBÜCHER.* Erfurt. O.

K. botanische Gesellschaft zu Regensburg. — See Allgemeine botanische Zeitschrift.

K. Kommission. . . . — See Ministerial-Kommission zur Untersuchung der deutschen Meere in Kiel.

K. Lehranstalt für Obst-, Wein- und Gartenbau zu Geisenheim a. Rhein.

BERICHT.* Wiesbaden. O.

K. Universität Erlangen. Botanischer Garten.

AUSWAHL von Sämereien.* Erlangen. Q.

K. Universtät Greifswald. Botanischer Garten.

SAMEN-Verzeichniss.* Greifswald. Sq. Q.

Königlicher botanischer Garten und Museum zu Berlin.

NOTIZBLATT.* Berlin. O.

K. botanischer Garten zu München.

SAMEN-Verzeichnis.* [München]. O.

Königsberg. — See Preussischer botanischer Verein in,.

Koloniaal museum te Haarlem.

BULLETIN.* Amsterdam. O.

Kolonial-wirtschaftliches Komitee. — See Der Tropenpflanzer.

Kolozsvári magyar kiralyi Ferencz-József-tudomány-egyetem. Hortus botanicus regiae universitatis claudinopolitanae.

SEMINA . . . offert.* Kolozsvár. F.

Kommission zur Untersuchung der deutschen Meere in Kiel. — See Ministerial-Kommission.

Kongelige danske Videnskabernes Selskab.

OVERSIGT over . . . Forhandlinger.* Kjøbenhavn. O.

K. Frederiks Universitet. Hortus botanicus christianensis.

DELECTUS seminum fructuum.* Christianiae. O.

K. norske Videnskabers Selskab.

AARSBERETNING.* Trondhjem. O.

SKRIFTER.* Trondhjem. O.

Kongliga fysiografiska sällskapet. — See Lunds universitet.

K. svenska vetenskaps-akademien.

BIHANG till handlingar. Afdelning III. Botanik.* Stockholm. O.

K. universitetet i Upsala. Hortus upsaliensis.

SEMINA selecta.* Upsaliae. Sq. F.

Koninklijke akademie van wetenschappen te Amsterdam.

VERHANDELINGEN, tweede sectie.* Amsterdam. Q.

VERSLAGEN . . . der wis- en natuurkundige afdeeling.* Amsterdam. Q.

K. natuurkundige vereeniging in Nederlandsch Indië. — See Natuurkundig tijdschrift.

K. nederlandsch aardrijkskundig genootschap.

VERSLAGEN.* Leiden. O.

K. zoölogisch botanisch genootschap te 's-Gravenhage.

VERSLAG.* [s' Gravenhage]. O.

Krakau. — See Akademia umiejętności.

Královské české společnosti náuk. — See Königlich-böhmische Gesellschaft der Wissenschaften.

Kruidkundig genootschap Dodonaea te Gent. — See Botanisch jaarboek.

La Mortola, Ventimiglia.

LIST of seeds collected.* La Mortola. O.

La Rochelle. — See Société des sciences naturelles de la Charente-Inférieure. (Académie des belles-lettres, sciences et arts de La Rochelle).

Laboratorio ed orto botanico, R. università degli studi di Siena. — See Regia università . . . di Siena.

Lagos. — See Botanic station, colony of,.

LAND OF sunshine.* Los Angeles. O.

's Lands plantentuin. [Buitenzorg].

ANNALES du jardin botanique de Buitenzorg. Leide. Q.

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National convention for the suppression of insect pests and plant diseases by legislation.
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ANNUAL report of the state botanist.* New York and Albany. O.
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Department of land records and agriculture.

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—— — See Government botanical gardens. — Government horticultural gardens.

Northamptonshire natural history society and field club.

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Prairie farmer.* Chicago. Q.
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—— — See Allgemeine botanische Zeitschrift.
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Monographs. Series relating to food.* La Fayette. O.
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Quarterly journal of microscopical science. London. O.
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R. accademia delle scienze dell' istituto di Bologna.
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R. accademia delle scienze di Torino.
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R. accademia di scienze, lettere e belle arti di Palermo.
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R. accademia di scienze lettere ed arti in Padova.
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R. accademia virgiliana di Mantova.
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R. istituto botanico di Roma. — See R. università degli studi di Roma.
R. istituto d'incoraggiamento di Napoli.
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Reale istituto di studi superiori pratici e di perfezionamento. Regius hortus botanicus florentinus.
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R. scuola superiore d'agricoltura in Portici.
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R. società toscana di orticultura.
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[BOTANICAL papers].* Modena. Q.
R. societas scientiarum . . . .— See Királyi magyar természettudományi társulat.
R. università degli studi di Palermo.
R. istituto di botanico.
CONTRIBUZIONI alla biologia vegetale.* Palermo. Q.
R. orto botanico.
BOLLETTINO.* Palermo. O.
INDEX seminum.* Palermo. O.
R. università degli studi di Napoli.
Hortus regius neapolitanus.
INDEX seminum.* Napoli. O.
R. università degli studi di Parma. Orto botanico.
INDEX seminum.* Parma. Q.
R. università degli studi di Pavia. Istituto botanico.
ATTI.* Milano. Q.
R. università degli studi di Roma.
R. istituto botanico.
ANNUARIO.* Milano, Roma. Q.
R. università degli studi di Siena.
Laboratorio ed orto botanico.
BULLETTINO.* Siena. O.
ENUMERATIO seminum.* Siena. O.
R. università di Pisa. Istituto botanico.
RICERCHE e lavori.* Pisa. Q.
R. universitas bononiensis. Hortus botanicus.
DELECTUS seminum.* Bononiae. F.
R. universitas claudinopolitana. — See Kolozsvári . . . Ferencz-József-tudomány-egyetem.

Registered pharmacist and Drug clerks journal.* Chicago. Q.
Regius hortus botanicus florentinus. — See Reale istituto di studi.
R. hortus botanicus senensis. — See Regia università . . . di Siena.
Reichenberg. — See Verein der Naturfreunde in,.
Reims. — See Société d'étude des sciences naturelles de,.
República mexicana. Secretaría de fomento, colonización é industria. — See Boletín de agricultura.
Revue bryologique. Cahan. O.
Revue de viticulture. Paris. Q.
Revue des sciences naturelles appliqueés.* Paris. O.
Revue générale de botanique. Paris. O.
Revue horticole.* Marseille. O.
—— Paris. O.
Revue mycologique. Toulouse. O.
Revue savoisienne.* Annecy. O.
Revue scientifique du Limousin.* Limoges. O.
Revue tunisienne.* Tunis. O.
Rheinlande. — See Naturhistorischer Verein der preussischen,.
Rheno-traiectina. — See Universitas,.
Rhode Island agricultural experiment station. [Kingston].
Bulletin.* Kingston. O.
Report.* Providence. O.
Rhodora. Boston, Providence. O.
Riga. — See Naturforscher-Verein zu,.
Rijks universiteit, Leiden. Hortus botanicus academicus lugduno batavus.
Delectus seminum.* Leide. Sq. Q.
Rivista di patologia vegetale. Avellino. O.
Rochefort. — See Société de géographie de,.
Rochelle. — See La Rochelle.
Rochester. — See City of,.
Rochester academy of science.
Proceedings.* Rochester. Q.

Roma. R. istituto botanico di,. — See Regia università . . . di,.
Românâ. — See Academia,.
[Rothamsted farm and laboratory.
REPORTS of field experiments].* Rothamsted. Q.
Roubaix. — See Cercle horticole de,.
Rouen. — See Académie des sciences . . . de,.
Rovereto. — See Imperiale reale accademia . . . in,.
Royal agricultural and commercial society of British Guiana. — See Timehri.
Royal agricultural society of England.
JOURNAL. London. O.
Royal Asiatic society.
Bombay branch.
JOURNAL.* Bombay. O.
China branch.
JOURNAL.* Shanghai. Q.
Royal botanic garden, Calcutta.
ANNALS.* Calcutta. Sq. F[4].
Royal botanic garden, Edinburgh.
LIST of seeds.* Edinburgh. O.
Royal botanic gardens, Ceylon. [Pérádeniya].
CIRCULAR.* Colombo. O.
REPORT.* Pérádeniya. F.
Royal botanic gardens, Glasnevin, Dublin. (Science and art department).
LIST of seeds for exchange.* Dublin. Sq. Q.
REPORT.* Dublin. O.
Royal botanic gardens, Trinidad.
ANNUAL report.* Trinidad. F.
BULLETIN of miscellaneous information.* Trinidad. O.
Royal botanic society of London.
QUARTERLY record.* London. O.
Royal colonial institute.
PROCEEDINGS.* London. O.

Royal gardens, Kew.
BULLETIN of miscellaneous information.* London. O.
—— — See Kew guild.
Royal horticultural society.
JOURNAL.* London. O.
REPORT of the council.* London. O.
Royal institution of Cornwall.
JOURNAL.* Truro. O.
Royal society of Canada.
PROCEEDINGS and transactions.* Montreal. Q.
Royal society of New South Wales.
ABSTRACT of proceedings.* [Sidney]. O.
JOURNAL and proceedings.* Sidney. O.
Royal society of Queensland.
PROCEEDINGS.* Brisbane. O.
Royal society of Victoria.
PROCEEDINGS.* Melbourne. O.
Rügen. — See Naturwissenschaftlicher Verein für . . . und,.
Rugby school natural history society.
REPORT.* Rugby. O.
RURAL New Yorker.* New York. F[5].
Sachsen. — See Oekonomische Gesellschaft . . . .,.
Saharanpur. — See Government botanical gardens, and Arnigadh.
Sajjan Niwas gardens, Oodeypore.
ANNUAL report.* Ajmere. F.
SALZBURGER Landwirthschafts-Blätter.* Salzburg. F[4].
San Francisco. Board of park commissioners.
ANNUAL report.* San Francisco. O.
Santiago de Chile. — See Deutscher wissenschaftlicher Verein zu,.
Saône-et-Loire. — See Société des sciences naturelles de,.
La Sarthe. — See Société d'agriculture, sciences et arts de,.
Schimmel & Co. (Fritzsche Brothers).
SEMI-ANNUAL report.* Leipzig & New York. D.

Schlesische Gesellschaft für vaterländische Cultur.
JAHRES-BERICHT.* Breslau. O.
—— — See Botanisches Centralblatt.
Schlesischer botanischer Tausch-Verein.
GENERAL-Doubletten-Verzeichnis.* Planegg. Q.
—— — See Allgemeine botanische Zeitschrift.
Schleswig-Holstein. — See Naturwissenschaftlicher Verein.
Schwaben. — See Naturwissenschaftlicher Verein für,.
Schweizerische botanische Gesellschaft.
BERICHTE.* Bern. O.
Schweizerische naturforschende Gesellschaft.
VERHANDLUNGEN.* Zürich, etc. O.
For alternate sessions see Société helvétique des sciences naturelles.
SCIENCE. New York. Q.
SCIENCE gossip. London. Q.
SCIENTIFIC memoirs by medical officers of the army of India. Calcutta. Q.
Seine-et-Oise. — See Société des sciences naturelles et médicales de,.
Selbourne society. — See Nature notes.
LA SEMAINE horticole.* Bruxelles. O.
Senckenbergische naturforschende Gesellschaft in Frankfurt am Main.
BERICHT.* Frankfurt a. M. O.
KATALOG.* Frankfurt a. M. O.
Senensis. R. hortus botanicus,. — See Regia università . . . di Siena.
Serbie. — See Jardin botanique du royaume de, à Belgrade.
Shaw school of botany. — See Washington university.
Siebenbürgische. — See Verein für, Landeskunde.
Siebenbürgischer Museumverein. — See Erdélyi múzeum-egylet.
Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt.
VERHANDLUNGEN und Mittheilungen.* Hermannstadt. O.

Siena. — See Regia università . . . di,.

Smichow. — See Kaiserlich-königliche deutsche Universität in Prag.

Smith college, Northampton, Mass., U. S. A. Botanic garden.

LIST of seeds collected.* [Northampton]. Sq. Q.

Smithsonian institution.

ANNUAL report of the board of regents.* Washington. O.

CONTRIBUTIONS to knowledge.* Washington. Q.

MISCELLANEOUS collections.* Washington. O.

Bureau of American ethnology.

ANNUAL report.* Washington. Q.

U. S. national museum.

BULLETIN.* Washington. O.

PROCEEDINGS.* Washington. O.

REPORT.* Washington. O.

Sociedad científica alemana. — See Deutscher wissenschaftlicher Verein zu Santiago de Chile.

Sociedad científica "Antonio Alzate."

MEMORIAS y revista.* México. O.

Sociedad científica argentina.

ANALES.* Buenos Aires. Q.

Sociedad española de historia natural.

ANALES.* Madrid. Q.

Sociedad mexicana de historia natural. — See La Naturaleza.

Sociedade broteriana.

BOLETIM.* Coimbra. Q.

Società adriatica di scienze naturali in Trieste.

BOLLETTINO.* Trieste. O.

Società botanica italiana.

BULLETTINO. Firenze. O.

MEMORIE. — See Nuovo giornale botanico italiano.

Società di naturalisti in Napoli.

BOLLETTINO.* Napoli. Q.

Società italiana di scienze naturali.
ATTI.* Milano. O.
Società toscana di scienze naturali.
ATTI.* [Pisa]. Q.
Societas pro fauna et flora fennica.
ACTA.* Helsingforsiae. O.
MEDDELANDEN.* Helsingfors. O.
——— See Botanisches Centralblatt.
SOCIETATUM litterae.* Frankfurt a. O. O.
Société belge de microscopie.
ANNALES.* Bruxelles. O.
BULLETIN.* Bruxelles. O.
Société botanique de Copenhague.
CATALOGUE des plantes.* København. Sq. O.
——— See Botanisk Tidsskrift.
Société botanique de France.
BULLETIN. Paris. O.
Société botanique de Genève.
BULLETIN.* Genève. O.
Société botanique de Lyon.
ANNALES.* [Lyon]. Q.
Société botanique des Deux-Sèvres, Vienne, Vendée.
BULLETIN.* Niort. O.
INTERMÉDIAIRE mensuel.* [Niort]. O.
Société botanique du Limousin. — See Revue scientifique du Limousin.
Société botanique suisse. — See Schweizerische botanische Gesellschaft.
Société centrale d'horticulture du Nord. Ancien Cercle horticole du Nord.
JOURNAL.* Lille. O.
Société centrale forestière de Belgique.
BULLETIN.* Bruxelles. O.
Société d'agriculture sciences et arts centrale du département du Nord séant à Douai.
MÉMOIRES.* Douai. Q.

Société d'agriculture, sciences et arts de la Sarthe.
BULLETIN.* Le Mans. Q.
Société d'agriculture sciences et arts du départment de la Haute-Saône.
BULLETIN.* Vesoul. O.
Société d'échanges botaniques silésienne. — See Schlesischer botanischer Tausch-Verein.
Société d'émulation du Doubs.
MÉMOIRES. Besançon. O.
Société d'émulation et d'agriculture (lettres, sciences et arts) de l'Ain.
ANNALES.* Bourg. O.
Société d'étude des sciences naturelles de Nimes.
BULLETIN.* Nimes. Q.
Société d'étude des sciences naturelles de Reims.
BULLETIN.* Reims. O.
Société d'études scientifiques d'Angers.
BULLETIN.* Angers. O.
Société d'histoire naturelle d'Autun.
BULLETIN.* Autun. Q.
Société d'histoire naturelle de Colmar. — See Naturhistorische Gesellschaft in Colmar.
Société d'horticulture du Japan.
JOURNAL.* Tokyo. O.
Société d'horticulture & de botanique des Bouches-du-Rhone. — See Revue horticole, Marseille.
Société de biologie.
COMPTES rendus hebdomadaires. Paris. O.
Société de Borda.
BULLETIN.* Dax. Q.
Société de géographie de Rochefort. (Agriculture, lettres, sciences et arts).
BULLETIN.* Rochefort. Q.
Société de physique et d'histoire naturelle de Genève.
COMPTE rendu.* Genève. O.
Société des naturalistes de Kiev. — See Kieffskoe obstchestvo estestvoispytatelei.

Société des sciences, agriculture et arts de la Basse-Alsace. — See Gesellschaft zur Förderung der Wissenschaften . . . im Unter-Elsass.

Société des sciences de Nancy. (Ancienne Société des sciences naturelles de Strasbourg).

BULLETIN.* Paris, Nancy. Q.

Société des sciences historiques & naturelles de la Corse.

BULLETIN.* Bastia. O.

Société des sciences historiques & naturelles de Semur.

BULLETIN.* Semur. Q.

Société des sciences naturelles de l' Ouest de la France.

BULLETIN.* Nantes. Q..

Société des sciences naturelles de la Charente-Inférieure.

ANNALES.* La Rochelle. O.

Société des sciences naturelles de Neuchatel.

BULLETIN.* Neuchatel. O.

Société des sciences naturelles de Saône-et-Loire.

BULLETIN.* Chalon-sur-Saône. Q.

Société des sciences naturelles de Strasbourg. — See Société des sciences de Nancy.

Société des sciences naturelles et médicales de Seine-et-Oise.

MÉMOIRES.* Versailles. O.

Société des touristes du Dauphiné.

ANNUAIRE.* Grenoble. O.

Société florimontane d'Annecy. — See Revue savoisienne.

Société fribourgeoise des sciences naturelles.

BULLETIN.* Fribourg. O.

Société helvétique des sciences naturelles.

ACTES.* Sion, etc. O.

For alternate sessions see Schweizerische . . . Gesellschaft.

COMPTE rendu des travaux.* Genève. O.

Société impériale des naturalistes de Moscou.

BULLETIN.* Moscou. O.

Société impériale des naturalistes de St. Pétersbourg. — See Imperatorskoe S.-Peterburgskoe obstchestvo estestvois-pytateleĭ.

Société linnéenne de Bordeaux.
Procès-verbaux.* Bordeaux.* Q.
Société linnéenne de Normandie.
Bulletin.* Caen. O.
Mémoires.* Caen. Sq. Q.
Société mycologique de France.
Bulletin.* Paris. O.
Société nationale d'acclimatation de France. — See Revue des sciences naturelles appliquées.
Société nationale d'agriculture, sciences & arts d'Angers. (Ancienne Académie d'Angers).
Mémoires.* Angers. O.
Société nationale des sciences naturelles et mathématiques de Cherbourg.
Mémoires.* Paris, Cherbourg. Q.
Société philomathique de Paris.
Bulletin. Paris. O.
Compte-rendu sommaire de séance. Paris. O.
Société royale de botanique de Belgique.
Bulletin.* Bruxelles. O.
Société royale des sciences de Liége.
Mémoires.* Bruxelles. O.
Société royale du Canada. — See Royal society of Canada.
Société scientifique industrielle de Marseille.
Bulletin.* Marseille. Q.
Société suisse de botanique. — See Société botanique de Genève.
Société vaudoise des sciences naturelles.
Bulletin.* Lausanne. O.
Society for the promotion of agricultural science.
Proceedings.* [La Fayette etc.]. O.
Society of apothecaries of London. Chelsea botanic garden.
List of seeds.* London. Q.
Society of arts. — See Technology quarterly.

South Carolina agricultural experiment station. [Clemson College].

ANNUAL report.* Charleston. O.

BULLETIN.* Greenville. O.

South Dakota. U. S. experiment station.

BULLETIN.* Brookings. O.

South Eastern naturalist.* Canterbury. Q.

Southern florist and gardener.* Chattanooga. Q.

Southland institute. — See New Zealand institute.

Southport society of natural science.

REPORT.* Southport. O.

THE SOUTHWEST.* Springfield, Mo. F[4].

Springfield, Massachusetts. Park commissioners.

REPORT.* Springfield. O.

St. Gallische naturwissenschaftliche Gesellschaft.

BERICHT.* St. Gallen. O.

St. Louis. — See Academy of science of,. — City of,. — United States department of agriculture. Weather bureau.

ST. LOUIS daily market reporter.* St. Louis. Sheets.

ST. LOUIS medical and surgical journal.* St. Louis. O.

St. Lucia. Botanic garden.

ANNUAL report.* Castries. F.

SYNOPSIS of meteorological observations.* — F.

St. Pétersbourg. — See Académie impériale des sciences de,. — Hortus botanicus imperialis petropolitanus. — Imperatorskoe S.-Peterburgskoe obstchestvo estestvoispytateleĭ. — Universitas imperialis petropolitana.

Stadtgarten in Karlsruhe i. B. — See Karlsruhe.

Städtischer botanischer Garten zu Görlitz. — See Görlitz.

Stanislas. — See Académie de,.

State agricultural college. — See Agricultural experiment station of Colorado.

State board of fish commissioners. — See Michigan fish commission.

State board of health of Massachusetts. — See Massachusetts.

State college of Kentucky. — See Kentucky agricultural experiment station.

State experiment stations. — See Louisiana state university.

State horticultural society of Missouri.

ANNUAL report.* Jefferson City. O.

State of Michigan — See Michigan.

State of Missouri. Bureau of geology and mines.

BIENNIAL report.* Jefferson City. O.

State of New York. — See New York state museum.

State of Wisconsin. Forestry commission.

REPORT.* Madison. O.

State university of Iowa.

BULLETIN from the laboratories of natural history.* Iowa City. O.

Staten Island. — See Natural science association of,.

Stavanger museum.

AARSBERETNING.* Stavanger. O.

LE STAZIONI sperimentali agrarie italiane.* Modena. Q.

Steiermark. — See Kaiserlich-königliche Gartenbau-Gesellschaft. — Naturwissenschaftlicher Verein für,.

Stockholm. — See Bergielunds botaniska trädgård. — Botaniska sällskapet i,.

Storrs agricultural experiment station. [Storrs, Ct.].

ANNUAL report.* Hartford, etc. O.

BULLETIN.* Storrs. O.

Straits settlements. Botanic gardens and forest department.

ANNUAL report.* Singapore. F.

Strasbourg. — See Société des sciences de Nancy.

Suisse. — See Société botanique,. — Société, de botanique.

Svenska trädgårdsföreningen.

TIDSKRIFT. Stockholm. Q.

Svenska vetenskaps-akademien. — See Kongliga,.

Technische Hochschule Carolo-Wilhelmina zu Braunschweig. Herzoglicher botanischer Garten.

SÄMEREIEN.* Braunschweig. F.

Technische Hochschule, Darmstadt. Botanischer Garten.
AUSWAHL von Sämereien.* Darmstadt. Sq. Q.
Technische Hochschule in Karlsruhe. — See Grossherzogliche,.
TECHNOLOGY quarterly and proceedings of the Society of arts.* Boston. Q.
Tennessee. — See University of,.
Tergestinus. — See Hortus botanicus,.
Texas academy of science.
TRANSACTIONS.* Austin. Q.
Texas agricultural experiment stations. [College Station].
BULLETIN.* Temple. O.
REPORT.* Austin. O.
Teyler. — See Musée,.
Thüringische botanische Gesellschaft "Irmischia" zu Arnstadt. — See Deutsche botanische Monatsschrift.
Thüringischer botanischer Verein.
MITTHEILUNGEN.* Weimar. O.
Thurgauische naturforschende Gesellschaft.
MITTEILUNGEN.* Frauenfeld. O.
Tiflis. — See Kaukasisches Museum.
Tiflisskiĭ botanicheskiĭ sad.
INDEX seminum.* Tiflis. O.
TRUDY.* Tiflis. Q.
TIMEHRI.* Demarara. O.
Tirol. — See Ferdinandeum für, und Vorarlberg.
Tōkyō. — See Imperial university of,.
Tōkyō botanical society. — See Botanical magazine.
Toledo. — See City of,.
Torino. — See Reale accademia delle scienze di,.
Toronto. — See University of,.
Torrey botanical club.
BULLETIN. New York. O.
MEMOIRS. New York. O.
Toscana. — See Reale società, di orticultura. — Società, di scienze naturali.

Toulouse. Jardin des plantes de la ville.
CATALOGUE des graines.* Toulouse. F⁴.
Traiectina. — See Universitas rheno-,.
Tree planting and fountain society of Brooklyn, N. Y.
REPORT.* Brooklyn. O.
Trencsén vármegyei természettudományi egylet.
ÉVKÖNYVE.* Trencsén. O.
Trieste. — See Hortus botanicus tergestinus. — Museo civico di storia naturale di,. — Società adriatica . . . in,.
Trinidad. — See Royal botanic gardens,.
Tromsø Museum.
AARSBERETNING.* Tromsø. O.
DER TROPENPFLANZER.* Berlin. O.
TUFTS COLLEGE studies.* Tufts College. Q.
Tuskegee normal and industrial institute. Experiment station.
BULLETIN.* Tuskegee. D.
Ulm a. D. — See Verein für Mathematik und Naturwissenschaft in,.
Ungarische Akademie der Wissenschaften. — See Királyi magyar természettudományi társulat.
Unique journal horticole japonais. — See Société d'horticulture du Japan.
United States agricultural experiment station of Nebraska. — See University of Nebraska.
U. S. civil service commission.
REPORT.* Washington. O.
U. S. commission of fish and fisheries.
BULLETIN.* Washington. Q.
REPORT of the commissioner.* Washington. O.
[U. S.] commissioner of education.
REPORT.* Washington. O.
U. S. department of agriculture.
ANNUAL reports.* Washington. O.
FARMERS' bulletin.* Washington. O.
LIBRARY bulletin.* Washington. O.

U. S. department of agriculture — *Continued.*
REPORT of the secretary.* Washington. O.
YEAR book.* Washington. O.
——— See National convention for the suppression of insect pests and plant diseases by legislation.
Bureau of animal industry.
BULLETIN.* Washington. O.
CIRCULAR.* Washington. O.
Division of agrostology.
BULLETIN.* Washington. O.
CIRCULAR.* [Washington]. O.
Division of biological survey.
CIRCULAR.* [Washington]. O.
——— See North American fauna.
Division of botany.
BULLETIN.* Washington. O.
CIRCULAR.* [Washington]. O.
CONTRIBUTIONS from the U. S. national herbarium.* Washington. O.
INVENTORY.* [Washington]. O.
Division of chemistry.
CIRCULAR.* Washington. O.
——— See Association of official agricultural chemists.
Division of entomology.
BIBLIOGRAPHY of the more important contributions to American economic entomology.* Washington. O.
BULLETIN.* Washington. O.
CIRCULAR.* [Washington]. O.
TECHNICAL series.* Washington. O.
——— See Association of economic entomologists.
Division of forestry.
BULLETIN.* Washington. O. & Q.
CIRCULAR.* [Washington]. O. & Q.
Division of pomology.
BULLETIN.* Washington. O.
CIRCULAR.* [Washington]. O.

U. S. department of agriculture — *Continued.*
Division of publications.
BULLETIN* Washington. O.
CIRCULAR.* Washington. O.
MONTHLY list of publications.* Washington. O.
Division of soils.
BULLETIN.* Washington. O.
Division of statistics.
CIRCULAR.* Washington. O.
Division of vegetable physiology and pathology.
BULLETIN.* Washington. O.
Office of experiment stations.
BULLETIN.* Washington. O.
REPORT of the director.* Washington. O.
—— — See Experiment station record.
Office of fiber investigations.
REPORT.* Washington. O.
Office of road inquiry.
BULLETIN.* Washington. O.
CIRCULAR.* Washington. O.
Office of the secretary.
CIRCULAR.* [Washington]. O.
Section of foreign markets.
BULLETIN.* Washington. O.
CIRCULAR.* [Washington]. O.
Weather bureau.
Iowa weather and crop service.
ANNUAL report.* Des Moines. O.
MONTHLY review.* Des Moines. Q.
WEATHER-crop bulletin.* [Des Moines]. Sheets.
MONTHLY meteorological summary. Station St. Louis, Mo.* [St. Louis]. Sheets.
MONTHLY weather review.* Washington. Q.
WEATHER map. For St. Louis and vicinity.* St. Louis. Sheets.
[U. S. department of state].
CONSULAR reports.* Washington. O.

U. S. experiment station, South Dakota. — See South Dakota.

U. S. fish commission. — See United States commission of fish and fisheries.

U. S. geological survey.

ANNUAL report.* Washington. Q.

U. S. national herbarium. — See United States department of agriculture. Division of botany.

U. S. national museum. — See Smithsonian institution.

Universidad literaria de Valencia. Jardín botánico.

SEMILLAS recolectados.* Valencia. Q.

Universidade de Coimbra. Hortus regius botanicus academicus conimbricensis.

INDEX seminum.* Conimbricae. O.

Università di Pavia. — See Regia,.

Universität Würzburg. Botanischer Garten.

AUSWAHL von Sämereien.* Würzburg. O.

Universität Zürich.

Botanischer Garten.

VERZEICHNIS . . . Sämereien und Früchte.* [Zürich]. O.

Botanischer Garten und . . . Museum.

[BERICHT].* Zürich. O.

VERZEICHNISS . . . Pflanzen.* Zürich. O.

Botanisches Museum.

MITTEILUNGEN.* Genève. O.

Universitas caesariea Novae-Rossiae. Hortus botanicus.

INDEX seminum.* Odessa. O.

UNIVERSITAS ferrariensis. Hortus botanicus.

DELECTUS seminum.* Ferrariae. O.

Universitas hauniensis. — See Kjøbenhavn's Universitet.

UNIVERSITAS imperialis petropolitana. Hortus botanicus.

INDEX . . . seminum.* St. Petersburg. O.

SCRIPTA botanica. S.- Peterburg. Q.

Universitas imperialis tokyoensis.— See Imperial university Tōkyō.

Universitas jurjevensis (olim dorpatensis). — See Imperatorskii . . . universitet.

Universitas lundensis. — See Lunds universitet.

Universitas parmensis. — See Regia università . . . di Parma.

Universitas rheno-traiectina. Hortus botanicus en botanisch laboratorium.

DELECTUS seminum.* Traiecti ad Rhenum. O.

[MONOGRAPHS].* Utrecht.

Universitas valentinae. — See Universidad literaria de Valencia.

Universitatea din Bucuresci. Gradina botanica.

CATALOG de seminţe.* Bucuresci. O.

CATALOGUL plantelor.* Bucuresci. O.

Université à Leide. — See Rijks universiteit.

Université d'Amsterdam. Jardin botanique.

CATALOGUE des graines.* Amsterdam. O.

Université de Bucarest. — See Universitatea din Bucuresci.

Université de Gand. — See Hoogeschool te Gent.

Université de Genève. Laboratoire de botanique générale.

BULLETIN.* Neuchatel. O.

Université de Grenoble. Jardins botaniques de Chamrousse et du Lauteret.

CATALOGUE des graines*. Grenoble. Q.

Université de Groningue. Jardin botanique.

CATALOGUE des graines.* Groningue. Q.

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